Creative Destruction and Subjective Well-Being*

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Abstract

This paper develops a simple Schumpeterian model of growth and unemployment to make predictions on how job and establishment turnover affect subjective well-being. To test the predictions of the model, we use a US cross-sectional MSA-level analysis. Our empirical findings vindicate the predictions of the theory, namely: (i) the effect of creative destruction on well-being is significantly positive if we control for MSA-level unemployment, less so if we do not; (ii) creative destruction has a more positive effect on anticipated well-being than on current well-being; (iii) creative destruction is positively associated with higher short-run "worry"; (iv) creative destruction has a more positive effect on well-being in MSAs with faster growing industries or with industries that are less prone to outsourcing.

JEL Codes: I31, J63, J65, O33, O38, Z19

Keywords: well-being, ladder, creative destruction, growth, turnover, unemployment

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1 Introduction

Does higher (per capita) GDP or GDP growth increase happiness? The existing empirical literature on happiness and income looks at how various measures of subjective well-being relate to income or income growth, but without going into further details into what drives the growth process.

Thus in his 1974 seminal work, Richard Easterlin provides evidence to the effect that, within a given country, happiness is positively correlated with income across individuals but this correlation no longer holds within a given country over time.[1] This Easterlin paradox is often explained by the idea that, at least past a certain income threshold, additional income enters life satisfaction only in a relative way;[2] Clark, Frijters and Shields (2008) provided a review of this large literature of which Luttmer (2005), Clark and Senik (2010), and Card, Mas and Moretti (2012) are prominent examples. Recent work has found little evidence of thresholds and a good deal of evidence linking higher incomes to higher life satisfaction, both across countries and over time. Thus in his cross-country analysis of the Gallup World Poll, Deaton (2008) finds a relationship between log of per capita GDP and life satisfaction which is positive and close to linear, i.e. with a similar slope for poor and rich countries, and if anything steeper for rich countries. Wolfers and Stevenson (2013) provide both cross-country and within-country evidence of a log-linear relationship between per capita GDP and well-being and they also fail to find a critical "satiation" income threshold.[3] Yet these issues remain far from settled, see for example the reviews by Frey and Stutzer (2002), Layard (2005) or Graham (2012) as well as the impressive new work investigating how happiness measures relate to economists' notions of utility (e.g. see Benjamin, Kimball, *et al.,* 2012). Importantly, however, none of these contributions looks into the determinants of growth and at how these determinants affect well-being. In this paper, we provide a first attempt at filling this gap.

More specifically, we look at how an important engine of growth, namely Schumpeterian creative destruction with its resulting flow of entry and exit of firms and jobs, affects subjective well-being differently for different types of individuals and in different types of labor markets.

Thus, in the first part of the paper we develop a simple Schumpeterian model of growth and

[1] Easterlin's results have been much debated. Some work even rejects the importance of income in life satisfaction across individuals within a country, arguing that income has a small effect relative to other circumstances of life such as unemployment or marital status (Blanchflower and Oswald, 2004), or that the effect of income is only temporary (Di Tella et al (2007), suggest that the effect of an income shock on life satisfaction disappears within four years).

[2] In other words, provided you can fulfill basic needs, what really matters for happiness is to be richer than one's neighbors or reference person.

[3] Interestingly, Deaton and Stone (2013) show that income impacts differently different measures of well-being but argue that relative income and well-being remains a puzzle of the literature. They distinguish between hedonic well-being ("did you experience a lot of happiness yesterday?), which could be consistent with a relative income story, and evaluative well-being (as measured by how individuals assess their lives on a 0 to 10 ladder), which is more closely related to absolute income. They also suggest alternative explanations for their overall evidence that would have to do with evaluative well-being being determined by "permanent income and hedonic well-being by more "transitory income.

unemployment to organize our thoughts and generate predictions on the potential effects of turnover on life satisfaction. In this model growth results from quality-improving innovations. Each time a new innovator enters a sector, the worker currently employed in that sector loses her job and the firm posts a new vacancy. Production in the sector resumes with the new technology only when the firm has found a new suitable worker. Life satisfaction is proxied by the expected discounted valuation of an individual's future earnings. In the model a higher rate of turnover has both direct and indirect effects on life satisfaction. The direct effects are that, everything else equal, more turnover translates into both, a higher probability of becoming unemployed for the employed which reduces life satisfaction, and a higher probability for the unemployed to find a new job, which increases life satisfaction. The indirect effect is that a higher rate of turnover implies a higher growth externality and therefore a higher net present value of future earnings: this enhances life satisfaction. Overall, a first prediction of the model is that the effect of turnover on well-being is unambiguously positive for given unemployment rate, but not otherwise. A second prediction is that a higher rate of innovation (i.e. a higher turnover rate) increases life satisfaction more the lower the individuals' discount rate. A third prediction is that higher turnover has a less positive (or more negative) effect on life satisfaction for more risk-averse individuals. [4]

In the second part of the paper we test the predictions of the model using cross-section MSA-level US data. We measure creative destruction we follow Davis, Haltiwanger and Schuh (1996) and use their measure of job turnover, defined as the job creation rate plus the job destruction rate. We also look at firm turnover, namely the sum of the establishment entry rate and the establishment exit rate. The data come from the Census' Business Dynamics Statistics (BDS) and are at the MSA level. For robustness checks, we also use the Longitudinal Employer-Household Dynamics (LEHD) data from the Census, which provides information on hires, separations, employment, and thus turnover, also at the MSA-level. To measure subjective well-being, we use the life satisfaction index from the Behavioral Risk Factor Surveillance System (BRFSS), and the Cantril ladder of life from the Gallup Healthways Wellbeing Index (Gallup), which asks about both, current and anticipated well-being. The BRFSS measure is constructed using the question "In general how satisfied are you with your life?"; the Cantril ladder is based on the following questions: "Imagine a ladder with steps numbered from zero at the bottom to 10 at the top; the top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time? And which level of the ladder do you anticipate to achieve in five years?" Another measure of well-being we also consider using the Gallup database, as it could more directly captures how individuals react

[4] In the Appendix we characterize the transitional dynamics of the model, and also extend the analysis to the case where job destruction can be partly exogenous, or to the case where the turnover rate is endogenously determined by a free entry condition.

to the risk involved in creative destruction, is the "worry" measure based on individual answers to the question: "Did you experience worry during a lot of the day yesterday?".

We investigate whether Schumpeterian creative destruction affects all these measures of well-being positively or negatively, by regressing our measures of subjective well-being on our creative destruction variables. Our main finding is that the effect of the turnover rate on well-being is unambiguously positive when we control for unemployment and less so if we do not. This result is consistent with the theory, and it is remarkably robust. In particular it holds: (i) whether looking at well-being at MSA-level or at individual level; (ii) whether looking at the life satisfaction measure from the BRFSS or at the Cantril Ladder measures from the Gallup survey; (iii) whether using the BDS or the LEHD data to construct our proxy for creative destruction. Next, we find that creative destruction increases individuals' worry - which reflects the fact that more creative destruction is associated with higher perceived risk by individuals -. Finally, when interacting creative destruction with MSA-level industry characteristics; we find that the positive effect of turnover on well-being is stronger in MSAs with above median productivity growth or with below median outsourcing trends.[5]

The paper relates to two main strands of literature. First, to the literature on subjective well being. There, as mentioned above, we contribute by including sectors and firms into the analysis. Second, to the literature on growth, job turnover and unemployment.[6] In particular this literature points to two opposite effects of growth on unemployment. One is a "capitalization" effect whereby more growth reduces the rate at which firms discount the future returns from creating a new vacancy: this effect pushes towards creating more vacancies and thus towards reducing the equilibrium unemployment. The counteracting effect is a "creative destruction" effect whereby more growth implies a higher rate of job destruction which in turn tends to increase the equilibrium level of unemployment. We contribute to this literature by looking at the counteracting effects of innovation-led growth on subjective well-being.

The remaining part of the paper is organized as follows. Section 2 develops the model and generates predictions on the effects of turnover on subjective well-being, and how these effects depend upon individual or local labor market characteristics. Section 3 describes the US data and the empirical approach underlying the cross-sectional part of the empirical analysis, and presents the corresponding empirical results. Section 4 concludes.

[5] In addition, when interacting with individual characteristics, creative destruction appears to increase life satisfaction more for non religious individuals than for religious ones, for smokers than for non-smokers, and for non-hispanic whites than for other ethnicities.

[6] E.g see Davis, Haltiwanger, and Schuh (1996), Mortensen and Pissarides (1998), and Aghion and Howitt (1998).

2 Theoretical analysis

2.1 A toy model

In this section, we will offer a simple model to motivate our empirical analysis. The source of economic growth is Schumpeterian creative destruction which at the same time generates endogenous obsolescence of firms and jobs. The workers in the obsolete firms join the unemployment pool until they are matched to a new firm. Higher firm turnover has both a positive effect (by increasing economic growth and by increasing employment prospects of unemployed workers) and a negative effect (by increasing the probability of currently employed workers losing their job) on well-being. Which effect dominates will in turn depend upon both, individual characteristics (discount rate, risk-aversion,...) and characteristics of the labor market (unemployment benefits,...).

2.1.1 Production technology and innovation

We consider a multi-sector Schumpeterian growth model in continuous time. The economy is populated by infinitely-lived and risk-neutral individuals of measure one, and they discount the future at rate[7]

$$r = \rho, \tag{1}$$

where ρ is the individual discount rate.

The final good is produced using a continuum of intermediate inputs, according to the logarithmic production function:

$$\ln Y_t = \int_{j \in \mathcal{J}} \ln y_{jt} dj$$

where $\mathcal{J} \subset [0,1]$ is the set of active product lines. We will denote its measure by $J \in [0,1]$. The measure J is invariant in steady state.

Each intermediate firm produces using one unit of labor according to the following linear production function,

$$y_{jt} = A_{jt} l_{jt},$$

where $l_{jt} = 1$ is the labor employed by the firm, and the same in all sectors. Thus the measure of inactive product lines is equal to the unemployment rate

$$u_t = 1 - J_t,$$

where u denotes the equilibrium unemployment rate. Our focus will be on balanced growth path equilibrium, therefore when possible, we will drop time subscripts to save notation.

[7] The analysis in this section can be straightforwardly extended to the case where individuals are risk-averse. See Section 2.3.2

2.1.2 Innovation and growth

An innovator in sector j at date t will move productivity in sector j from A_{jt-1} to $A_{jt} = \lambda A_{jt-1}$. The innovator is a new entrant, and entry occurs in each sector with Poisson arrival rate x which we assume to be exogenous.[8] Upon entry in any sector, the previous incumbent firm becomes obsolete[9] and its worker loses her job and the entering firm posts a new vacancy with an instantaneous cost cY.[10] Production in that sector resumes with the new technology when the firm has found a new suitable worker.

2.1.3 Labor market and job matching

Following Pissarides (1990), we let

$$m(u_t, v_t) = u_t^{\alpha} v_t^{1-\alpha} \tag{2}$$

denote the arrival rate of new matches between firms and workers, where u_t denotes the number of unemployed at time t and v_t denotes the number of vacancies. Thus the flow probability for each unemployed worker to find a suitable firm is

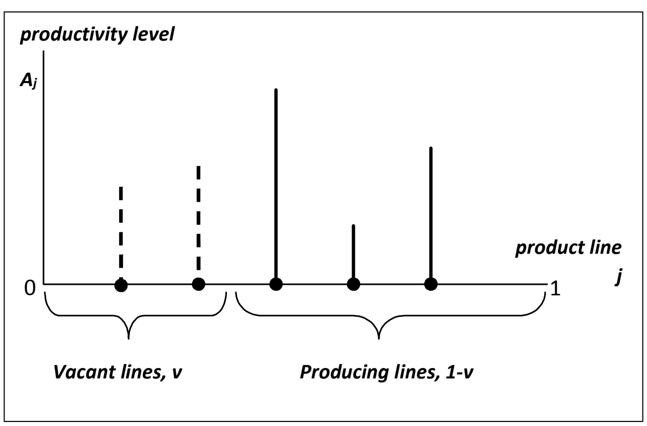
$$m(u_t, v_t)/u_t,$$

whereas the probability for any new entrant firm to find a suitable new worker is

$$m(u_t, v_t)/v_t.$$

In steady state, there will a constant fraction of product lines that are *vacant* (of measure v), and the remaining fraction will be *producing*. We illustrate this economy in the following figure:

FIGURE 1. MODEL ECONOMY



[8] See the Appendix for an extension of the model where we endogeneize entry.
[9] In the Appendix we extend the model so as to also allow for exogenous job destruction.
[10] Below we provide sufficient conditions under which the incumbent firm in any sector will choose to leave the market as soon as a new entrant shows up in that sector. The basic story is that, conditional upon a new entrant showing up, it becomes profitable for the incumbent firm to seek an alternative use of her assets.

Finally, we assume that in each intermediate sector where a worker is currently employed, the worker appropriates fraction β of profits whereas the complementary fraction $(1-\beta)$ accrues to the employer.

2.1.4 Valuations and life satisfaction

Our proxy for life satisfaction is the average present value of an individual employee, namely:

$$W_t = u_t U_t + (1-u_t)E_t,$$

where U_t is the net present value of an individual who is currently unemployed, and E_t is the net present value of an individual who is currently employed.[11]

The value of being currently employed, satisfies the asset equation:

$$\rho E_t - \dot{E}_t = w_t + x(U_t - E_t).$$

In words: the annuity value of being currently employed is equal to the capital gain $\dot{E}_t$ plus the wage rate w_t at time t and with arrival rate x the worker becomes unemployed as the incumbent firm is being displaced by a new entrant. Here we already see the negative effect of turnover on currently employed workers.

Similarly the value of being unemployed satisfies the asset equation:

$$\rho U_t - \dot{U}_t = b_t + (m(u_t, v_t)/u_t)(E_t - U_t).$$

As before, the annuity value of being currently unemployed is equal to the capital gain $\dot{U}_t$ plus the unemployment benefit b_t accruing to an unemployed worker, and with arrival rate $m(u_t, v_t)/u_t$ the unemployed worker escapes unemployment. For any given unemployment rate, turnover has a positive effect on the value of unemployed because it creates job opportunities.

2.2 Solving the model

We now proceed to solve the model for equilibrium production and profits, for the equilibrium steady-state unemployment rate, for the steady-state growth rate, and for the equilibrium value of life satisfaction.

2.2.1 Static production decision and equilibrium profits

Let w_t denote the wage rate at date t. The logarithmic technology for final good production implies that final good producer spends the same amount Y_t on each variety j. As a result, the final good production function generates a unit elastic demand with respect to each variety: $y_{jt} = Y_t/p_{jt}$.

[11] Thus our theoretical measure of subjective well-being is the ex ante expected valuation of a representative individual who does not know yet whether she will start being employed or unemployed. In the next section, we shall argue that the anticipated Cantril ladder is a good empirical proxy for this ex ante valuation indicator.

Note that the cost of production is simply w_{jt} which is the firm-specific wage rate. Then the profit is simply

$$\pi_{jt} = p_{jt} y_{jt} - w_{jt} = Y_t - w_{jt}. \tag{3}$$

Next, the above sharing rule between wage and profits implies that $w_{jt} = \beta \left(Y_t - w_{jt}\right)$, hence

$$w_{jt} = w_t = \frac{\beta}{1+\beta} Y_t, \text{ and } \pi_{jt} = \frac{1}{1+\beta} Y_t = \pi Y.$$

Clearly β determines the allocation of income in the economy, with a higher β shifting the income distribution towards workers.[12]

2.2.2 Steady state equilibrium unemployment

Our focus is on a steady state equilibrium in which all aggregate variables (Y_t, w_t, U_t, E_t) grow at the same constant rate g, and where the measure of unemployed u and the number of vacancies and the interest remain constant over time.[13] Henceforth, we can drop the time index from now on.

In steady state, the flow out of unemployment must equal the flow into unemployment. Namely:

$$m(u, v) = (1-u)x. \tag{6}$$

The left-hand side is the flow out of unemployment, the right hand side is the flow into unemployment, equal to the number of active sectors $(1-u)$ time the turnover rate x.

In addition, the number of sectors without an employed worker is equal to the number of sectors with an open vacancy, $u = v$. Combining this fact with the matching technology (2), we get:

$$m = u = v. \tag{7}$$

[12] Denote the value of an incumbent before entry by V_1 and after entry V_2. Then we can express these value functions as

$$rV_1 - \dot{V}_1 = \pi Y + x\left(V_2 - V_1\right), \text{ and } rV_2 - \dot{V}_2 = \pi Y + \frac{m}{v}\left(0 - V_2\right).$$

Since in equilibrium $m = v$, we get

$$V_2 = \frac{\pi Y}{1+r-g}. \tag{4}$$

Then we can express V_1 as

$$V_1 = \frac{(1-\beta)\pi Y + xV_2}{x+r-g} \tag{5}$$

Note that (4) implies $\pi Y = (1+r-g)\, V_2$. Substitute this into (5) :

$$V_1 = V_2 + \frac{V_2}{x+r-g} > V_2.$$

Hence any outside option O such that $V_1 > O > V_2$:

$$\frac{\pi Y}{1+r-g}\left(1 + \frac{1}{x+r+g}\right) > O > \frac{\pi Y}{1+r-g}$$

implies the incumbent firm will exit as soon as there is a new entrant. This is what we assume throughout this section.

[13] In the Appendix we analyze the transitional dynamics of this model.

Putting these equations (6) and (7) together, we obtain the equilibrium unemployment rate $u = (1-u)x$, or equivalently

$$u = \frac{x}{1+x}. \tag{8}$$

That the numerator of u be increasing in x reflects the job destruction effect of turnover on currently employed workers; that the denominator be also increasing in x reflects the positive effect a higher turnover rate has on the job finding rate of currently unemployment workers. The former effect effect dominates here, with the equilibrium unemployment rate being increasing in the turnover rate x. But we will see below that things may be different when we introduce the possibility of exogenous job destruction on top of innovation-driven job destruction.

Now we can express the growth rate of the economy.

Lemma 1 *The balanced growth path growth rate of the economy is equal to*

$$g = m \ln \lambda,$$

where m denotes the flow of sectors in which a new innovation is being implemented (i.e., the rate at which new firm-worker matches occur).

Proof. See Appendix. ■

Then, using the fact that in steady-state equilibrium we have:

$$m = u = \frac{x}{1+x},$$

we get the equilibrium growth rate as,

$$g = \frac{x}{1+x} \ln \lambda. \tag{9}$$

As expected, the growth rate is increasing in the turnover rate x and with the innovation step size λ.

2.2.3 Equilibrium valuations and life satisfaction

Recall that our proxy for life satisfaction is the average present value of an individual employee, namely:

$$W = uU + (1-u)E,$$

where:

$$rE - \dot{E} = \beta \pi Y + x(U - E), \text{ and} \tag{10}$$

$$rU - \dot{U} = bY + (m(u,v)/u)(E - U). \tag{11}$$

Now, using the fact that in steady state $\dot{E} = gE$ and $\dot{U} = gU$,and that in equilibrium (see equation (7)) $m/u = 1$, we obtain, after subtracting the second equation from the first:

$$(r-g)(E-U) = BY + (1+x)(U-E),$$

where $B \equiv \beta\pi - b$.

This in turn implies that the difference between the value of being employed and unemployed depends positively on the flow income difference B, also positively on the growth rate but negatively on the turnover rate as a higher turnover rate implies an increased risk of becoming unemployed:

$$E - U = \frac{BY}{r-g+1+x}.$$

Substituting for $(E-U)$ in the above asset equations (10) and (11), yields:

$$U = \left[bY + \frac{BY}{r-g+1+x}\right]\frac{1}{r-g}; \text{ and } E = \left[\beta\pi Y - \frac{xBY}{r-g+1+x}\right]\frac{1}{r-g}.$$

so that, after substituting for E and U in the expression for W, and using the fact that in equilibrium $u = x/(1+x)$, we get the following expression for life satisfaction when individuals are risk neutral with $u(c) = c$:

$$W = \frac{Y}{r-g}\left[\beta\pi - \frac{xB}{1+x}\right]$$

where

$$g = \frac{x}{1+x}\ln\lambda \text{ and } B \equiv \beta\pi - b.$$

We thus see two effects of turnover on life satisfaction. First, for given growth rate g, more turnover reduces life satisfaction. This is the *displacement* effect mentioned in the introduction: namely, higher turnover leads to a higher probability of workers losing their current job. On the other hand, higher turnover increases the growth rate g which in turns acts favorably on life satisfaction: this is the *capitalization* effect mentioned in the introduction. When does either effect dominate the other? The following proposition answers that question:

Proposition 1 *A higher turnover rate x increases life satisfaction W more the lower the discount rate ρ, i.e.:*

$$\frac{\partial^2 W}{\partial x \partial \rho} < 0$$

And life satisfaction increases with turnover when $\rho < \frac{\beta\pi\ln\lambda}{B}$, and it decreases with turnover otherwise. Moreover, life satisfaction increases more with creative destruction (i.e. with x) when the unemployment benefit is more generous. i.e.:

$$\frac{\partial^2 W}{\partial x \partial b} > 0.$$

Proof. The proposition follows immediately from the fact that:

$$\frac{\partial W}{\partial x} = \frac{Y\left[\beta\pi \ln \lambda - B\rho\right]}{\left[(1+x)\left(\rho - \ln \lambda\right) + \ln \lambda\right]^2} > 0.$$

so that

$$\frac{\partial^2 W}{\partial x \partial b} = \frac{Y\rho}{\left[(1+x)\left(\rho - \ln \lambda\right) + \ln \lambda\right]^2} > 0.$$

■

The condition for creative destruction having a positive net effect $\left(\beta\pi\left[1-\frac{\ln\lambda}{\rho}\right] < b\right)$ is intuitive: If people care more about the future (lower ρ), or if the innovation step size is bigger (bigger λ), then the growth effect dominates and life satisfaction increases in the turnover rate x. Young workers have longer horizon than old workers. Therefore we can approximate worker age by their discount rate such that older workers have higher ρ. Then the above proposition generates the prediction that life satisfaction should increase more with turnover for younger individuals than for older individuals, and that it may actually decrease with turnover for the latter when it increases with turnover for the former.

Remark: The above analysis and proposition consider the effect of creative destruction on life satisfaction, factoring in the effect of creative destruction on unemployment. Now *if we look at the effect of turnover on life satisfaction controlling for unemployment, this effect is unambiguously positive*. To see this formally, recall that:

$$W = uU + (1-u)E,$$

where E and U are expressed in (10) and (11) . Now, using the fact that $m(u,v)/u = (1-u)x/u$ and that in steady state $\dot{E} = gE$ and $\dot{U} = gU$, we obtain:

$$E - U = \frac{BY}{r - g + x/u}.$$

Substituting for $(E-U)$ in the asset equations (10) and (11), yields:

$$U = \left[bY + \frac{[(1-u)x/u]BY}{r-g+x/u}\right]\frac{1}{r-g}, \tag{12}$$

and

$$E = \left[\beta\pi Y - \frac{xBY}{r-g+x/u}\right]\frac{1}{r-g}. \tag{13}$$

so that we get the following expression for life satisfaction when individuals are risk neutral with $u(c) = c$:

$$W = \frac{Y}{r-g}[ub + (1-u)\beta\pi]$$

which for given u is increasing in x since it is increasing in g and g is increasing in x.

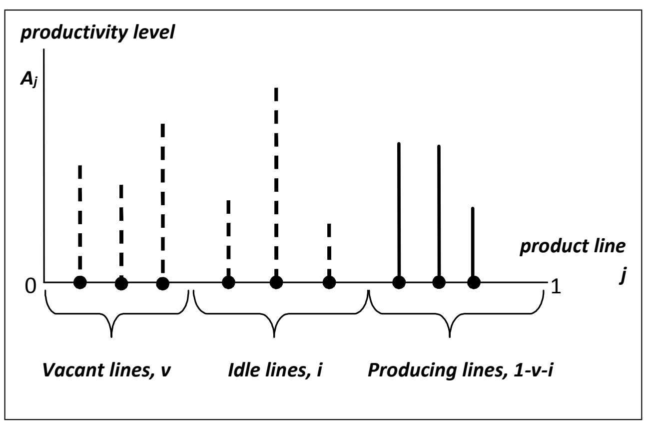
2.3 Theoretical Extensions

2.3.1 Exogenous job destruction

So far, the only source of job destruction, as well as job creation, was new entry. However, in reality, new entry is not the only source of job destruction. Following Pissarides (1990) we now allow for an additional -exogenous- source of job destruction rate. To capture this, we assume that each job is destroyed at the rate ϕ. Upon this destruction shock, the worker joins the unemployment pool and the product line becomes *idle*. When a new entrant comes into this product line at the rate x, it first posts a vacancy in which case then the same product line moves from being *idle* to being *vacant*. Finally, when a vacant product line finds a suitable worker, the product line becomes *producing*. Similarly, if a new entrant enters into a currently producing line, then the sector becomes directly *vacant,* the incumbent worker joins the unemployment pool, and the new entrant searches for a new suitable worker.

In steady state, there will a constant fraction of product lines that are *vacant* (of measure v), a constant fraction of lines that are *idle* (of measure i) and the remaining fraction will be *producing*. We illustrate this economy in the following figure:

FIGURE 2. ECONOMY WITH EXOGENOUS JOB DESTRUCTION



Next, one can compute the steady state fraction of idle, vacant, and producing lines using the following flow equations:

$$
\begin{aligned}
(1-v)\,x &= m; \\
(1-v-i)\,\phi &= ix.
\end{aligned}
$$

The left hand side of the first equation is the flow of sectors *into* the *vacant* stage: it is equal to the flow of productive sectors which become (directly) vacant, namely $(1-v-i)x$, plus the flow of idle sectors which become vacant, namely ix.The sum of these two terms is equal to $(1-v)x$.

The right hand side of the first equation is the flow of sectors *out of* the vacant stage: it is simply equal to the job matching rate m.

Similarly, the left hand side of the second equation is the flow *into* the *idle* stage: it is equal to the flow of producing sectors which become idle, namely $(1-i-v)$ times the flow probability ϕ of an exogenous job destruction shock in such a sector. The right hand side is equal to the flow *out of* the idle stage. It is equal to the number of idle sectors times the flow probability of a new entry in such a sector, which will make it become vacant: namely, ix.

By definition unemployment is equal to all the product lines where there is no production, therefore:

$$u = i + v$$

Hence the above flow equations can be reexpressed as

$$(1-v)\,x = m, \text{ and } (1-u)\,\phi = (u-v)\,x. \tag{14}$$

Moreover, the matching technology is such that

$$m = u^{\alpha} v^{1-\alpha} \tag{15}$$

Substituting (15) into (14) we get

$$(1-v)\,x = u^{\alpha} v^{1-\alpha}, \text{ and } (1-u)\,\phi = (u-v)\,x. \tag{16}$$

These last two equations give us a system of 2-equations and 2-unknowns. For analytical tractability, assume $\alpha = 0.5$. Then the equilibrium unemployment rate solves a simple quadratic equation, yielding the solution:

$$u = 1 - \frac{(\Psi+1) - \sqrt{(\Psi+1)^2 - 4\left[\Psi - \Psi^2 x^2\right]}}{2\left[\Psi - \Psi^2 x^2\right]}$$

where $\Psi \equiv 1 + \phi/x$.

Unlike in the previous subsection, the relationship between entry and unemployment, and therefore between growth and unemployment, is no longer automatically monotonic. Here, jobs are being destroyed both by creative destruction at the rate x and also by the exogenous shock ϕ. The only source of job creation is job postings that happens though new entrants. Hence, one would expect that when ϕ is large, then the main role of entry will be job creation whereas when ϕ is very low, then we are back to the previous model and entry will mainly create unemployment. This is evident in Figure 3 that plots the unemployment rate against the entry rate for various values of the exogenous destruction rate $\phi \in \{0, 0.2, 0.9\}$. As expected, as $\phi \to 0$, entry (turnover) and unemployment becomes positively correlated: in this case the *job destruction effect* dominates the job creation effect. On the other hand, when ϕ is very high, then the relationship is negative:

in that case the *job creation effect* of innovation-led growth on unemployment dominates the job destruction effect.

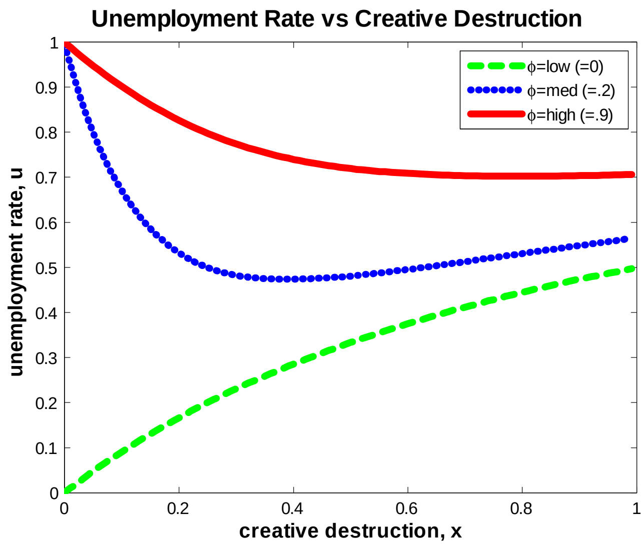


FIGURE 3.

Now, moving to the relationship between the innovation-led turnover rate x and well-being W, Figure 4 shows that the higher the exogenous job destruction rate ϕ, the more positive the effect of x on W, especially for small initial values of x : this is not surprising, as the lower x is relative to ϕ, the more the job creation effect of increasing x dominates the job destruction effect.

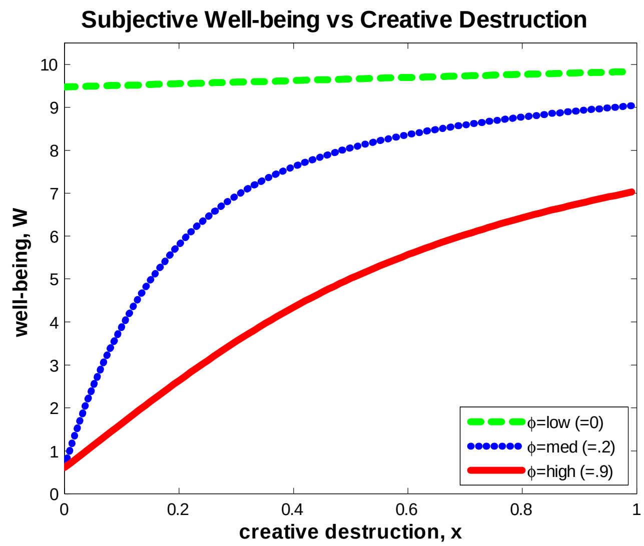


FIGURE 4.

2.3.2 Risk aversion

We now consider the case where individuals are risk averse with instantaneous preferences $U = \ln C$, and compute the steady-state value functions under this assumption. Recall that the individuals discount the future at the rate ρ. Then the value functions for currently employed and unemployed individuals satisfy the asset equations:

$$\begin{aligned} \rho E - \dot{E} &= \ln(\beta \pi Y) + x(U - E) \\ \rho U - \dot{U} &= \ln(bY) + (m(u,v)/u)(E - U) \end{aligned}$$

From this we get:

Lemma 2 *The value functions take the following form*

$$\begin{aligned} E &= \frac{1}{\rho}\left[\ln(\beta\pi) - \frac{x\ln(\beta\pi/b)}{1+x+\rho} + \frac{g}{\rho} + \ln Y\right] \quad \textit{and} \\ U &= \frac{1}{\rho}\left[\ln(b) + \frac{\ln(\beta\pi/b)}{1+x+\rho} + \frac{g}{\rho} + \ln Y\right] \end{aligned}$$

Proof. See Appendix. ■

Using the above expressions for E and U, well-being can be shown to be equal to:

$$W^{u(c)=\ln c} = \frac{1}{\rho}\left[\frac{x}{1+x}\ln(b) + \frac{1}{1+x}\ln(\beta\pi)\right] + \frac{1}{\rho}\left[\frac{g}{\rho} + \ln Y\right]$$

This expression shows that for given growth rate well-being is affected more negatively by creative destruction than in the risk neutrality case: since here the agent is risk averse, more asymmetry between the returns when employed ($\beta\pi$) and when unemployed (b) lowers her well-being by more.

The net effect of creative destruction on well-being will ultimately depend upon the size of the asymmetry and upon the magnitude of the growth effect: in particular, if the unemployment benefit is too low relative to the wage rate, or if the growth effect is too small, then the overall effect of creative destruction on well-being is negative. More precisely:

Proposition 2 *When agents are risk averse with $U = \ln C$ and the unemployment benefit is sufficiently low, namely $b < \frac{\beta\pi}{\lambda^{1/\rho}}$, then a higher turnover rate x decreases life satisfaction W :*

$$\frac{\partial W^{u(c)=\ln c}}{\partial x} < 0.$$

This proposition states that, when agents are risk averse, job loss is perceived more detrimentally than when they are risk neutral. Consequently, there is a range of unemployment benefits for which higher turnover reduces life satisfaction for risk averse individuals with log preferences whereas it would increase life satisfaction for risk-neutral individuals:

$$\beta\pi\left[1 - \frac{\ln\lambda}{\rho}\right] < b < \frac{\beta\pi}{\lambda^{1/\rho}}$$

Finally, moving continuously from the baseline case where individuals are risk-neutral towards the risk-averse case where individuals have log preferences, makes the effect of creative destruction on life satisfaction become increasingly less positive (or increasingly more negative).[14]

3 Data and empirical framework

3.1 Data

The data on creative destruction come from the Business Dynamics Statistics, which provide, at the metropolitan level (MSA), information on job creation and destruction rates as well as on the entry and exit rates of establishments. These rates are computed from the whole universe of firms as described in the Census Longitudinal Business Database. Our main measure of creative destruction is the "job turnover rate", defined as the sum of the job creation and job destruction rates. We also analyze the role of creation rates and destruction rates separately. We look at alternative measures of creative destruction in our robustness checks.

The data on subjective well-being come from two sources. First, the Gallup Healthways Well-being Index, which collects data on 1,000 randomly selected Americans each day through phone interviews. The period covered is 2008-2011. To our knowledge there is no dataset on subjective well-being with a larger sample size.[15] Subjective well-being in Gallup is assessed through various questions aimed at capturing different dimensions of well-being. Some questions target the individual's current *emotional* state [16] and are framed along those lines: "Did you experience worry/sadness/happiness a lot of the day yesterday?". Answers are binary, 0 or 1. We use the "worry" variable, which is the variable most likely to capture the effect of the (unemployment) risk associated with creative destruction. Alternatively, the "Cantril ladder of life" questions are destined to measure the individual's *evaluation* of her life. Each individual is asked: "Please imagine a ladder with steps numbered from zero at the bottom to 10 at the top; the top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you; on which step of the ladder would you say you personally feel you stand at this time?";

[14] More formally, if

$$W(x,\varepsilon) = (1-\varepsilon)W^{u(c)=c}(x) + \varepsilon W^{u(c)=\ln c}(x),$$

where

$$W^{u(c)=c} = \frac{Y}{r-g}\left[\beta\pi - \frac{xB}{1+x}\right]$$

is the equilibrium life satisfaction when individuals are risk neutral with $u(c) = c$ (see above), the variable ε reflects the degree of risk aversion, and we have

$$\frac{\partial^2 W}{\partial x \partial \varepsilon} < 0.$$

[15] Only the BRFSS is of comparable size.

[16] See Kahneman and Deaton (2010) for the distinction between emotional and evaluative well-being

and then "which level of the ladder do you anticipate to achieve in five years?". We refer to answers to the first question as the "current ladder" and to the second one as the "anticipated ladder". The "anticipated ladder" measure is particularly interesting as we recall that the theoretical well-being indicator W analyzed in the previous section is precisely an expectation, namely the ex ante expected valuation of an individual who does not know yet whether she will start being employed or unemployed.

The second source of data on subjective well-being is the Behavioral Risk Factor and Surveillance System (BRFSS). The sample size is also roughly 350,000 respondents per year, and the period covered is 2005-2010. To proxy for subjective well-being in the BRFSS, we use the Life Satisfaction question: "In general how satisfied are you with your life?". The possible answers are: "Very satisfied"; "Satisfied"; "Dissatisfied"; "Very dissatisfied". We recode these answers so that "Very dissatisfied" corresponds to grade 1 and "Very satisfied" corresponds to grade 4. The descriptive statistics of our data can be found in Table 1.

TABLE 1 *HERE*

3.2 Estimation framework

The model highlights two opposite forces whereby creative destruction impacts subjective well-being: the negative effect that comes from the higher risk of unemployment and the positive effect through higher growth expectations. A testable prediction of the model is that when regressing subjective well-being measures on creative destruction variables, controlling for the unemployment rate should capture part of the negative force of creative destruction and thus lead to a more positive coefficient of creative destruction on well-being than without the control for unemployment.

Our measure of creative destruction varies at the MSA level, thus we estimate MSA-level regressions. However, in order to take advantage of our micro-level data on subjective well-being, we also perform individual-level regressions that allow us to have a richer and more meaningful set of controls. [17]

In both cases, regressions are OLS and the first exercise we perform is to compare the coefficients from a baseline specification with and without the control for the MSA-level unemployment rate. We restrict the analysis to working age individuals (18-60 years old) to be closer to the model in which individuals are either employed or unemployed. [18]

At the MSA level, we look at purely cross-sectional regressions where we average our subjective well-being data at the MSA-level and across the different years available: 2005-2010 for the BRFSS

[17] Individual characteristics like marital status do not vary much if we aggregate them at the MSA level, yet they are very important determinants of well-being at the individual level

[18] However, we performed all the regressions for the whole population as well: the coefficients are qualititatively similar but with a slightly lower magnitude.

data (Table 2, panel A), and 2008-2011 for the Gallup data (Table 2, panel B and C, and Table 3). Table 2 focuses on life satisfaction, as measured either by the BRFSS, or by the current and anticipated ladder of the Gallup-Healthways Wellbeing Index. Table 3 investigates the effect on an alternative dimension of well-being: individual's "worry". In all cases, we also look at how the effect of creative destruction is decomposed into a "job creation" effect and a "job destruction" effect.

We then perform individual level regressions, where we control for individual characteristics such as education and ethnicity, as well as gender, marital status, and age. Income is not an innocuous control as the effect of creative destruction is likely to operate precisely through income, so we show results separately with and without this control.

The specification is as follows:

$$SWB_{i,m,t} = \alpha CD_{m,t} + \beta U_{m,t} + \delta X_{i,t} + T_t + \epsilon_{i,t} \quad , \tag{17}$$

where $SWB_{m,t}$ is subjective well-being for individual i who lives in MSA m in year t. This measure is derived either through the life satisfaction question of the BRFSS or through the current ladder question or the anticipated ladder question in the Gallup survey. $CD_{m,t}$ is creative destruction in MSA m in year t, which we take to be either the sum of the job creation rate and the job destruction rate, or these two components introduced separately but simultaneously in the regression. $U_{m,t}$ is the unemployment rate in that MSA in year t. $X_{i,t}$ are individual-level controls: gender, a polynomial in age, race, detailed education, detailed family status and, in some specifications, income brackets. T_t are year and month fixed effects. And $\epsilon_{m,t}$ is the error term. A constant is also included and standard errors are clustered at the MSA level. The main coefficient of interest is α. We look at how this coefficient changes depending on whether or not we control for unemployment. We perform several robustness checks which we discuss below. We then look at how the effect of creative destruction differs according to the sectoral composition of the MSA: some sectors have stronger or weaker employment prospects, depending on their growth rate or on their tendency to outsource.

3.3 Baseline results

3.3.1 MSA-level results

Table 2 shows the results from the baseline OLS regressions at the MSA level. Panel A of Table 2 is based on the BRFSS dataset and thus the dependent variable is the Life Satisfaction index constructed from answers to the question "How satisfied are you with your life?". Column (1) shows a negative effect of unemployment on Life Satisfaction. Column (2) shows a non-significant effect of job turnover on Life Satisfaction. Column (3) shows that once we control for unemployment, then job turnover has a positive and significant effect on Life Satisfaction. This is in line with our model which predicts that controlling for unemployment, turnover should only have a positive effect on well-being as it implies higher growth and higher probability for currently unemployed workers of finding a new job. Column (4) decomposes job turnover between job creation and job destruction. We see the positive effect of job creation and the negative effect of job destruction, although the latter is more than halved once we control for unemployment (Column (5)).

Panel B of Table 2 reproduces the same exercise but using the Gallup survey and the corresponding Cantril ladder indicator. Remarkably, even though the data set and measure are completely different from those in the BRFSS, the results exactly mirror those from the BRFSS, namely: (i) a negative effect of unemployment on the Cantril ladder in Column (1); (ii) a non-significant effect of job turnover on the ladder in Column (2); (iii) a positive and significant effect of turnover on the ladder once we control for unemployment in Column (3); (iv) a positive effect of job creation and a negative effect of job destruction in Column (4), the latter being more than halved once we control for unemployment (Column (5)).

TABLE 2 *HERE*

Panel C of Table 2 reproduces the same regression analysis but looking at the effect of job turnover on the Anticipated ladder (which again uses the Gallup data). By comparing with Panel B, we first see that job turnover has a stronger effect on the Anticipated ladder than on the current Cantril ladder. Moreover, Column (2) shows that job turnover has a positive and significant effect on the Anticipated ladder even if we do not control for unemployment. This in turn points to the notion that individuals disentangle the short-run losses from becoming unemployed as a result of job turnover from the long-term gains associated with higher growth and more new job opportunities in the future. This view is confirmed by looking at Column (4) which shows that the negative effect of job destruction on the Anticipated ladder is non-significant even if we do not control for unemployment.

Table 3 looks at the effect of job turnover on the "Worry" measure of well-being. We see that job turnover increases "worry" when we do not control for unemployment, and that the coefficient loses significance when we do control for unemployment. This again is in line with the theory, and suggests that one source of short-run stress from higher turnover is due to the increased probability of becoming unemployed.

TABLE 3 *HERE*

Now, consider the magnitudes of the various effects. Consistently across both datasets, the magnitude of the effect of creative destruction on current life satisfaction is in the same ballpark as that of the effect of the unemployment rate. In particular, moving from an MSA which is at the 25th percentile in terms of its level of creative destruction (i.e with a job creation rate + destruction rate at 25.4%) to an MSA at the 75th percentile (i.e with a job creation rate plus job destruction rate at 29.7%) is associated with an increase in the current ladder of life of 0.057 points (Column (3) in Table 2, Panel B). As a benchmark, looking at the same regression, moving from the 75th to the 25th percentile in terms of the unemployment rate (that is, from a 9% to a 7.1% unemployment rate) is associated with an increase in life satisfaction of 0.066 points. Another way to put it is that a one standard deviation increase in job turnover has an effect equivalent to a one standard deviation increase in the MSA level unemployment rate.

When focusing on anticipated well-being, that is, on Panel C of Table 2, the effect of creative destruction is slightly stronger than that of the unemployment rate. Indeed, a one standard deviation increase in job turnover has an effect on the future ladder of life equivalent to a 2.2 standard deviation increase in the MSA-level unemployment rate.

Overall, creative destruction has an effect on subjective well-being of the opposite sign from that of unemployment but of similar magnitude when measuring well-being by current life satisfaction; and the effect of creative destruction on subjective well-being is of a higher magnitude than that of unemployment when measuring well-being by anticipated life satisfaction (i.e by the Anticipated ladder).

3.3.2 Individual level results

In Tables 4 to 7, we perform individual-level regressions using the BRFSS and the Gallup data and find qualitatively similar results as in Tables 2 and 3. The difference is that we now also control for year and month fixed effects and individual-level characteristics (although the main source of variation remains cross-sectional).

$TABLES$ 4, 5, 6 and 7 $HERE$

Panels "A" in all Tables 4 to 7, are without individual demographic controls, whereas Panels "B" in these tables include all controls except individual income and Panels "C" also control for individual income brackets. Our preferred specification in all tables is that of Panels "B", as the model predicts that the indirect positive effect of job turnover on individual well-being goes through a higher net present value of earnings, and controlling for self-reported income might shut down this latter channel.

The magnitude of the creative destruction effect is roughly similar to that displayed at the MSA level, although slightly smaller. A one standard deviation increase in job turnover has an effect on current life satisfaction, whether measured by the BRFSS or the ladder of life, which is equivalent to that of an increase by half a standard deviation in the MSA-level unemployment rate. And it has an effect on the future ladder of life equivalent to that of a three standard deviation increase in the MSA-level unemployment rate.

Note that MSA-level variables have an effect smaller than the effect of an individual's own characteristics but that does not mean that the effects of MSA-level variables are negligible. To be more precise, a one standard deviation increase in job turnover has an effect on life satisfaction of the same size as an additional 2,000$ of individual annual earnings using the BRFSS data.

3.4 Robustness analysis

3.4.1 Alternative database for creative destruction

As an alternative to the creative destruction data from the Census' Business Dynamics Statistics (BDS), here we use the Longitudinal Employer-Household Dynamics (LEHD) dataset constructed by the Census bureau. These data are constructed based on the Quarterly Census of Employment and Wages (QCEW) and other administrative and survey data. They contain information on employment, earnings, and job flows at the MSA and/or county level with a detailed industry breakdown. The only state that does not participate in this program is Massachusetts (and Puerto Rico). We will take advantage in the next subsections of the detailed breakdown at the industry level. In terms of creative destruction: rather than job creations and destructions, the data give us the number of hires and separations. They give both the raw numbers of all hires and separations that occur during a given quarter in a given MSA, and the numbers of so-called "stable hires", that is hires that lasted at least a full quarter, and so-called "separations from stable jobs", that is a separation from a job that had begun in the previous quarter. To compute the turnover rates, we divide these hires or separations by the average stock of employment between the previous quarter and the current one (or the average stock of stable jobs for the "stable job turnover" measure). Because the concept is slightly different from that of the Business Dynamics Statistics, which is constructed based on firms' job creations rather than on individuals' hires, the correlation between our proxy for creative destruction in the two different datasets is around 0.5. Table 8 shows the robustness of the MSA-level baseline results to using this alternative measure of creative destruction (with slightly more positive coefficients for stable job turnover).

TABLE 8 HERE

3.4.2 From actual to predicted creative destruction

To abstract from the effects of local changes in industry composition, or from the effects of purely local shocks that could get mixed up with variations in local turnover, we consider a "predicted measure" (or Bartik-type measure) of creative destruction which is constructed as follows:

$$\widehat{CD}_{m,t} = \sum_j \omega_{i,m,2004} \times CD_{j,USA,t}$$

For each MSA m in year t, the predicted level of Creative Destruction, $\widehat{CD}_{m,t}$, is computed by taking a weighted average of countrywide turnover measures in sector j year t, $CD_{j,t}$, with weights being determined by the sectoral structure in the MSA in 2004, $\omega_{j,m,2004}$.

We thus reproduce the baseline individual-level regressions, replacing the direct local turnover variable by its predicted value $\widehat{CD}_{m,t}$. The controls on the right-hand side of the regression equation include the previous individual controls (gender, ethnicity, education, age,...), year and month fixed effects, to which we add the initial sectoral composition in the MSA in 2004. Standard errors are still clustered at the MSA level. [19]

Because we need a detailed industrial breakdown, we use the turnover measures from the LEHD, i.e. those used in Table 8. Columns (1) and (2) of Table 9 show the baseline effects of these turnover measures on well-being. Columns (2) and (4) introduce the control for initial sectoral composition: the positive effect of turnover remain significant but the magnitude halves. Columns (3) and (6) are the columns of interest as they replace the direct turnover measure by the predicted variable. Comparing between Columns (2) and (3), a one standard deviation increase in the predicted variable is associated with a 1.1% increase in life satisfaction, whereas a one standard deviation increase in the direct measure of turnover is associated with a 0.85% increase in life satisfaction. This in turn suggests that the "local shocks" component of turnover is an "adverse" component in the sense that it has a negative effect on well-being: indeed, when we purge the estimates from these local shocks to focus on variations in turnover driven by national changes in the various sectors, the effect of turnover is slightly more strongly positive.

TABLE 9 HERE

3.5 Interactions

We now interact turnover with MSA-level characteristics, and more precisely with the industry composition of the MSAs. Namely, we look at whether the effect of job turnover on well-being differs according to whether the dominant sectors of the MSA have lower or stronger growth potential and have a higher or lower propensity to outsource their activities abroad.

In Table 10 we interact job turnover (or the job creation and job destruction rates separately) with a dummy for being in an MSA above median in terms of the productivity growth in the

[19] If we assume that the sectoral composition in an MSA in 2004 has no effect on subjective well-being in that same MSA in 2005-2011, we could use our predicted measure of creative destruction as an instrument to try and get at whether the effect of creative destruction on subjective well-being is causal.

MSA's industries. The productivity growth measure is constructed as the Bartik variable in the above subsection: namely, as a weighted average of productivity growth in the different sectors (3 digits NAICS manufacturing sectors), with weights corresponding to sector shares in the MSA's total employment. The source for the productivity measure is the NBER-CES Manufacturing Industry database. This database stops in 2009, thus predicted productivity growth is averaged for each MSA over the period 2005-2009. Table 10 shows that turnover has a more positive effect on well-being in MSAs where industries are growing faster than median. Panel A shows results with weights fixed at their 2005 level. Panel B shows that we obtain very similar results if we use time-varying weights.

TABLE 10 *HERE*

In Table 11 we perform the same exercise except that we look at the extent to which industries outsource: presumably, the effect of turnover on well-being should be less positive in MSAs where the economic activity is more dominated by industries which outsource more, the idea being that job destruction is more likely to be irreversible in such MSAs. To proxy the extent to which a sector is prone to outsourcing, we follow Autor et al (2013) and use the growth of imports from China in that sector over the period 1991-2007. Sectoral variation is within the 3 digits NAICS manufacturing. Table 11 confirms that turnover has a less positive effect on well-being in MSAs where industries are more prone to outsource their activities.

TABLE 11 *HERE*

4 Conclusion

In this paper we have analyzed the relationship between turnover-driven growth and subjective well-being, using cross-sectional MSA level US data. We have first built a Schumpeterian model of growth and unemployment to make predictions on how job and firm turnover affect well-being under various circumstances. Our main conclusion is that theory works: namely: (i) the effect of creative destruction on well-being is unambiguously positive if we control for MSA-level unemployment, less so if we do not; (ii) creative destruction has a more positive effect on future well-being than on current well-being; (iii) creative destruction has a more positive effect on well-being in MSAs with faster growing industries or with industries that are less prone to outsourcing.

The analysis in this paper can be extended in several directions. A first avenue would be to use a similar combination of theory, cross-section analysis, and longitudinal analysis to investigate other potential determinants of well-being and compare them with the determinants of (per capita) GDP growth. A second extension would be to look at how the relationship between turnover and well-being is affected by individual characteristics and by characteristics of labor markets (training systems, availability of vocational education,..). A third extension would be to look for policy shocks (labor market reforms,...) that may affect the relationship between creative destruction and well-being. These and other extensions of the analysis in this paper are left for future research.

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5 Appendix

5.1 Proof of Lemma 1

The output in this economy is

$$\ln Y_t = \int_{j \in \mathcal{J}} \ln A_{jt} dj \equiv (1-u) \ln \bar{A}_t$$

Then after a small time interval Δt :

$$\begin{aligned} \ln Y_{t+\Delta t} &= \int_{\mathcal{J}} \left[x\Delta t \times 0 + (1 - x\Delta t) \ln A_{jt} \right] dj + \int_{\mathcal{J}'} \left[\frac{m}{v} \Delta t \ln (1+\lambda) \bar{A}_t + \left(1 - \frac{m}{v}\Delta t\right) \times 0 \right] dj \\ &= (1 - x\Delta t)(1-u) \ln \bar{A}_t + u \frac{m}{v} \Delta t \ln (1+\lambda) \bar{A}_t \\ &= [1-u] \ln \bar{A}_t + m\Delta t \ln (1+\lambda) \end{aligned}$$

Hence we can find the growth rate as

$$g = \lim_{\Delta t \to 0} \frac{\ln Y_{t+\Delta t} - \ln Y_t}{\Delta t} = m \ln (1+\lambda)$$

5.2 Transitional dynamics

Now we focus on a sudden change in the entry rate to analyze its impact on the economy's transition from one steady state to the next.

Assume that the economy starts at its steady state with entry rate x_{low} and the entry rate suddenly increases from x_{low} to x_{hgh} such that $x_{hgh} > x_{low}$. We start by focusing on the unemployment rate first. After the change in the entry rate, the flow equation of the unemployment rate becomes

$$\dot{u}_t = (1 - u_t) x_{hgh} - m_t.$$

Since $u_t = v_t$ in every period, we get $m_t = u_t = v_t$; therefore

$$\dot{u}_t = x_{hgh} - (1 + x_{hgh}) u_t. \tag{18}$$

The solution to this differential equation is simply

$$u_t = \left[\frac{x_{low}}{1 + x_{low}} - \frac{x_{hgh}}{1 + x_{hgh}} \right] e^{-\left(1 + x_{hgh}\right)t} + \frac{x_{hgh}}{1 + x_{hgh}}.$$

Recall that the growth rate is simply $g = m \ln \lambda$. Therefore the aggregate growth rate of this economy during transition is

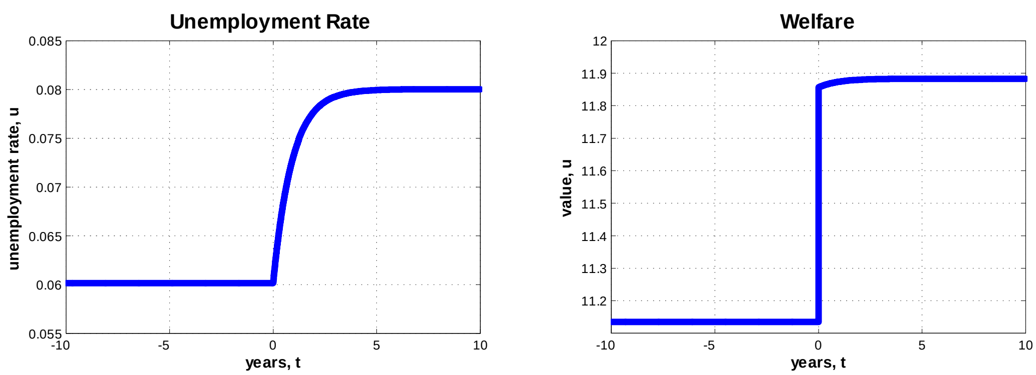
$$g_t = \left\{ \left[\frac{x_{low}}{1 + x_{low}} - \frac{x_{hgh}}{1 + x_{hgh}} \right] e^{-\left(1 + x_{hgh}\right)t} + \frac{x_{hgh}}{1 + x_{hgh}} \right\} \ln \lambda.$$

Now we turn to the value functions

$$rE_t - \dot{E}_t = \beta \pi Y_t + x_{hgh}(U_t - E_t), \text{ and } rU_t - \dot{U}_t = bY_t + (m_t(u_t, v_t)/u_t)(E_t - U_t).$$

Note that out of the steady state, it is not possible to solve these value functions further analytically. However, we can explore them numerically. For that, we need to determine 6 parameters: λ, x_{hgh}, x_{low}, ρ, β, and b. Since our model is stylized, our goal here is to show you the numerical properties of the model, rather than trying to provide a detailed calibration exercise. We pick the discount rate, which also corresponds to the interest rate in the benchmark model, to be $\rho = 5\%$. We will set $x_{low} = 6.4\%$ and $x_{hgh} = 8.7\%$ such that the steady-state unemployment rates are 6% and 8%, respectively. We set $\lambda = 1.18$ in order to obtain an initial steady state growth rate of 1%. The worker share of output is chosen to be $\beta = 0.9$ such that the profit share of the firm is 10%. Finally we set the unemployment benefit to be $b = 0.3\%$.

The following figures illustrate this experiment. Until time 0, the economy is at its initial steady state and at $t = 0$, the rate of creative destruction increases from x_{low} to x_{hgh}. The left figure shows the evolution of the unemployment rate and the right figure shows the effect on equilibrium welfare. For expositional purposes, we plot the welfare after normalizing it by the aggregate output every period.



(A) (B)

FIGURE 5.

After the change, the unemployment rate starts to evolve towards its new level according to the law of motion in (18). What we see is that the convergence is quick and the economy assumes its new steady state value almost after 6 years. The impact on welfare is slightly different. After the sudden change, the welfare function features a sudden jump at time 0 and then starts to evolve towards the new steady state. The big change in welfare occurs at the time of the change in creative destruction and the remaining portion of the transition has much lower impact on the new level of welfare.

The following figures illustrate the change in welfare, i.e. $\Delta W_t = W_{t>0} - W_{t=0}$ for different values of the discount rate ρ and unemployment benefit b.

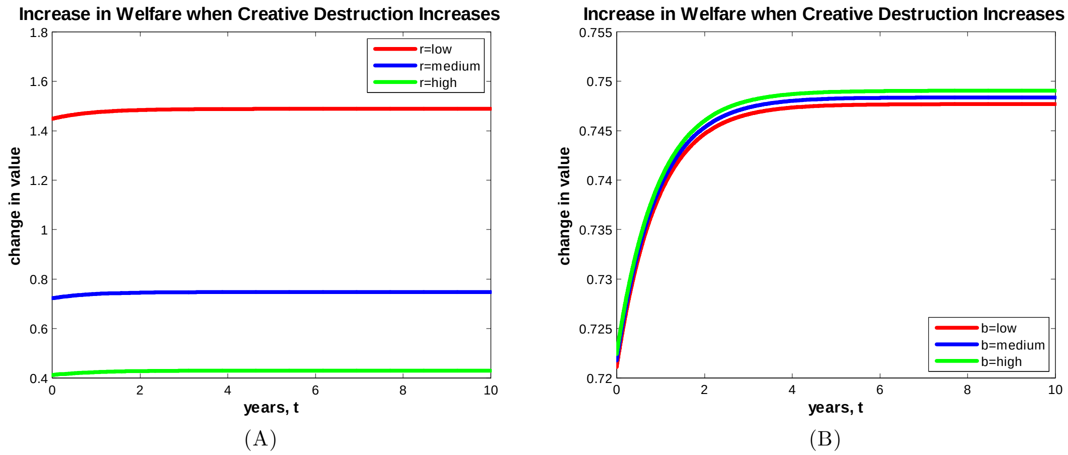


FIGURE 6.

These results confirm the steady state results in Proposition 1. The left figure shows that the increase in welfare after the increase in entry is higher, the higher is the unemployment benefit. Similarly, the increase in welfare is higher, the lower is the discount rate. Hence, the steady state results of the benchmark model are confirmed in this simple numerical exercise even when the transitions are taken into account.

5.3 Endogeneizing the turnover rate

In this section, we endogeneize the turnover rate x. To this end, we first solve for the value function of posting a vacancy (V) and a filled vacancy (P) that is currently producing. If the cost of posting a vacancy is cY, which we think as the registration fee that has to be paid to the government, then we can write the value of a vacancy as

$$rV - \dot{V} = -cY + \frac{m}{v}\left[P - V\right].$$

Note that a vacancy is filled at the rate $\frac{m}{v}$. The value of a filled vacancy is

$$rP - \dot{P} = \pi Y + x\left[0 - P\right]$$

In steady state we get the following values

$$P = \frac{\pi Y}{r - g + x} \tag{19}$$

and

$$V = \frac{Y}{r - g + 1}\left[-c + \frac{\pi}{r - g + x}\right]. \tag{20}$$

Now we are ready to introduce free entry. There is a mass of outsiders enter at the flow of innovation x. Then the free entry condition is simply equates the value of vacancy to 0:

$$V = 0. \tag{21}$$

Then using (20) and (21) we find the entry rate as

$$x = \frac{\pi}{c} - r + g.$$

This equation is intuitive. The entry rate increases in flow profits and decreases in the cost of vacancy. Moreover, it increases in the equilibrium growth rate due to *capitalization* effect (it indicates that any formed business today will have higher future growth opportunities).

Recall that $r = \rho$ from the household maximization and $g = \frac{x}{1+x} \ln \lambda$. Hence equation (21) is reexpressed as

$$x = \frac{\pi}{c} - \rho + \frac{x}{1+x} \ln \lambda.$$

To ensure the existence of a unique equilibrium, it is sufficient to have the following assumption.

Assumption: The discounted sum of future profits is greater than cost of posting vacancy $\frac{\pi}{\rho} > c$.

Then the entry rate is implicitly determined as

$$x = \Pi + \frac{x}{1+x} \ln \lambda$$

where $\Pi \equiv \frac{\pi}{c} - \rho$. Hence

$$x = \frac{-\left(1 - \Pi - \ln \lambda\right) + \sqrt{\left(1 - \Pi - \ln \lambda\right)^2 + 4\Pi}}{2}. \tag{22}$$

Proposition 3 *There exists a unique entry rate x. Moreover, the equilibrium entry rate is increasing in profits π and innovation size λ and decreasing in the cost of posting vacancy c and discount rate ρ*

$$\frac{\partial x}{\partial \pi}, \frac{\partial x}{\partial \lambda} > 0 \quad \textit{and} \quad \frac{\partial x}{\partial \rho}, \frac{\partial x}{\partial c} < 0.$$

Finally, we close the model by specifying the budget constraint of the government that has to finance the unemployment benefit bY_t. One can think of the vacancy cost as the tax (or registration fee) that has to be paid to the government to enter the economy and actively search for a worker. To keep the model tractable, we can assume that this fee paid to the government is equal to the unemployment benefit such that $c = b$, which would also ensure that budget constraint of the government is satisfied period by period.[20] An intuitive implication of this assumption would be that if the unemployment benefits are higher, this would discourage entry into vacancy due to lower returns from doing business.

[20] If revenues were generated through other sources, in particular through taxing incumbents , then revenues might be larger than the benefits that are distributed in the economy. In that case, we would need to assume that the government burns the additional surplus or gives it back to individuals, which then would translate into higher *effective* benefits. Since such an equilibrium feedback (or more generally the optimal policy to raise government revenue) is not the focus of our analysis, we simply assume $c = b$.

6 Tables

Table 1: (A) Summary statistics- MSA-level variables

	Observations	Mean	Standard deviation	Min	Max
MSA level averages of subjective well-being variables					
Life satisfaction (BRFSS, 2005-2010)	364	3.37	0.046	3.14	3.58
Anticipated ladder (Gallup, 2008-2011)	363	7.80	0.170	7.10	8.22
Current ladder (Gallup, 2008-2011)	363	6.86	0.117	6.37	7.44
Worry (Gallup, 2008-2011)	363	0.32	0.023	0.22	0.40
Creative destruction and unemployment rate					
2005-2010 averages (Table 2 panel A)					
Job turnover rate	366	0.29	0.035	0.18	0.43
Job creation rate	366	0.15	0.015	0.08	0.22
Job destruction rate	366	0.14	0.017	0.09	0.22
Unemployment rate	366	0.07	0.015	0.03	0.24
2008-2011 averages (Table 2 panel B and C, Table 3)					
Job turnover rate	366	0.28	0.031	0.16	0.41
Job creation rate	366	0.13	0.015	0.08	0.21
Job destruction rate	366	0.14	0.017	0.08	0.22
Unemployment rate	366	0.08	0.019	0.03	0.28

Table 1: (B) Summary statistics- Individual-level variables

	Mean	Standard deviation	Min	Max
Panel A: Gallup data, 2008-2011 Sample size: 836,805				
Subjective well-being				
Current ladder	6.86	1.99	0	10
Anticipated ladder	7.77	2.20	0	10
Worry	0.32	0.47	0	1
Individual covariates				
Female	0.51	0.49	0	1
Age	40	12.3	18	60
Married or partner	0.58	0.49	0	1
Non-Hispanic White	0.81	0.39	0	1
Black	0.12	0.33	0	1
Asian	0.02	0.14	0	1
Hispanic	0.13	0.33	0	1
Graduate school	0.15	0.35	0	1
College degree	0.18	0.39	0	1
Some college	0.23	0.42	0	1
High school	0.28	0.45	0	1
Technical degree	0.06	0.23	0	1
Less than high school	0.11	0.31	0	1
Panel B: BRFSS data, 2005-2010 Sample size: 964,869				
Subjective well-being				
Life satisfaction	3.37	0.63	1	4
Individual covariates				
Female	0.51	0.50	0	1
Age	39	11.9	18	60
White	0.65	0.48	0	1
Black	0.11	0.31	0	1
Asian	0.03	0.18	0	1
Natives	0.03	0.06	0	1
Multiracial	0.16	0.37	0	1
College or more	0.35	0.48	0	1
Some college	0.27	0.44	0	1
High school graduate or GED	0.27	0.44	0	1
High school dropout	0.07	0.26	0	1
No high school	0.04	0.19	0	1

Table 2: MSA-level averages - Life satisfaction

	(1)	(2)	(3)	(4)	(5)
VARIABLES			Subjective well-being		
Panel A: "How satisfied are you with your life?" (BRFSS, 2005-2010 averages)					
Unemployment rate	-1.790***		-1.927***		-1.599***
	(0.251)		(0.244)		(0.249)
Job turnover rate		0.0306	0.228***		
		(0.103)	(0.0767)		
Job creation rate				1.936***	1.166***
				(0.325)	(0.307)
Job destruction rate				-2.240***	-0.964**
				(0.423)	(0.432)
Observations	364	364	364	364	364
R-squared	0.282	0.000	0.307	0.174	0.344
Panel B: Cantril ladder of life (Gallup data, 2008-2011 averages)					
Unemployment rate	-2.678***		-3.443***		-2.440***
	(0.566)		(0.580)		(0.551)
Job turnover rate		0.525	1.305***		
		(0.368)	(0.370)		
Job creation rate				6.452***	4.794***
				(1.106)	(0.980)
Job destruction rate				-4.483***	-2.062***
				(0.773)	(0.700)
Observations	363	363	363	363	363
R-squared	0.139	0.014	0.214	0.191	0.267
Panel C: Anticipated Cantril ladder (Gallup data, 2008-2011 averages)					
Unemployment rate	-0.499		-1.890***		-1.299**
	(0.529)		(0.467)		(0.512)
Job turnover rate		1.959***	2.388***		
		(0.291)	(0.319)		
Job creation rate				5.329***	4.447***
				(0.895)	(0.883)
Job destruction rate				-0.888	0.401
				(0.739)	(0.876)
Observations	363	363	363	363	363
R-squared	0.004	0.168	0.222	0.219	0.238

Note: The dependent variables are MSA-level weighted averages of life satisfaction measures, coming either from the BRFSS (Panel A) or from Gallup (Panel B and C). The weights used to compute the MSA-level averages are the weights attached to each respondent by either the BRFSS or Gallup. The sample years are 2005-2010 for BRFSS and 2008-2011 for Gallup. The independent variables are averages across either 2005-2010 (Panel A) or 2008-2011 (Panel B and C) of MSA-level unemployment rates (column 1, 3 and 5), job turnover rates (column 2 and 3), job creation and job destruction rates (column 4 and 5). The unemployment rates come from the Bureau of Labor Statistics (Local Area Unemployment Statistics). The job creation and job destruction rates come from the Business Dynamics Statistics from the Census Bureau. The job creation (destruction) rate is the sum of all employment gains (losses) from expanding establishments from year (t-1) to year t including establishment startups, divided by the average employment in year t and (t-1). The job turnover rate is defined as the sum of the job creation rate and the job destruction rate. There is no additional control besides the coefficient displayed. In each regression MSAs are weighted by the sum of the weights of the respondents in that MSA.

Table 3: MSA-level averages - Worry

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Worry (Gallup data, 2008-2011 averages)				
Unemployment rate	0.549***		0.500***		0.427***
	(0.0802)		(0.0859)		(0.0913)
Job turnover rate		0.200***	0.0865		
		(0.0603)	(0.0585)		
Job creation rate				-0.459**	-0.169
				(0.185)	(0.170)
Job destruction rate				0.757***	0.334**
				(0.146)	(0.148)
Observations	363	363	363	363	363
R-squared	0.175	0.059	0.185	0.125	0.194

Note: The dependent variables is MSA-level weighted averages of the worry meaasure from Gallup. The weights used to compute the MSA-level averages are the weights attached to each respondent by Gallup. The sample years are 2008-2011. The independent variables are averages across the years 2008-2011 of MSA-level unemployment rates (column 1, 3 and 5), job turnover rates (column 2 and 3), job creation and job destruction rates (column 4 and 5). The unemployment rates come from the Bureau of Labor Statistics (Local Area Unemployment Statistics). The job creation and job destruction rates come from the Business Dynamics Statistics from the Census Bureau. The job creation (destruction) rate is the sum of all employment gains (losses) from expanding establishments from year (t-1) to year t including establishment startups, divided by the average employment in year t and (t-1). The job turnover rate is defined as the sum of the job creation rate and the job destruction rate. There is no additional control besides the coefficient displayed. In each regression MSAs are weighted by the sum of the weights of the respondents in that MSA.

Table 4: Individual-level results; BRFSS data

	(1)	(2)	(3)	(4)	(5)
VARIABLES	"How satisfied are you with your life?"				
Panel A: Without individual controls					
Unemployment rate	-1.440***		-1.510***		-1.465***
	(0.174)		(0.172)		(0.179)
Job turnover rate		0.0305	0.155**		
		(0.0831)	(0.0653)		
Job creation rate				0.371***	0.240***
				(0.106)	(0.0899)
Job destruction rate				-0.342**	0.0552
				(0.137)	(0.105)
Year and Month F.E.	x	x	x	x	x
Observations	856,906	856,248	856,248	856,248	856,248
R-squared	0.002	0.000	0.002	0.000	0.002
Panel B: With individual level controls (age, education, race, gender, marital status)					
Unemployment rate	-0.803***		-0.887***		-0.847***
	(0.136)		(0.135)		(0.141)
Job turnover rate		0.148***	0.214***		
		(0.0570)	(0.0512)		
Job creation rate				0.374***	0.290***
				(0.0888)	(0.0816)
Job destruction rate				-0.0982	0.124*
				(0.0828)	(0.0725)
Year and Month F.E.	x	x	x	x	x
Observations	856,812	856,154	856,154	856,154	856,154
R-squared	0.074	0.073	0.074	0.073	0.074
Panel C: All individual level controls of Panel B + income					
Unemployment rate	-0.549***		-0.595***		-0.548***
	(0.119)		(0.117)		(0.123)
Job turnover rate		0.0756	0.120**		
		(0.0550)	(0.0509)		
Job creation rate				0.263***	0.209**
				(0.0839)	(0.0826)
Job destruction rate				-0.129	0.0147
				(0.0832)	(0.0764)
Year and Month F.E.	x	x	x	x	x
Observations	856,809	856,151	856,151	856,151	856,151
R-squared	0.102	0.101	0.102	0.101	0.102

Note: The dependent variable is the BRFSS life satisfaction measure over the periode 2005-2010. Column (1) regresses it on the unemployment rate of the MSA the respondent lives in. Column (2) regresses it on the job turnover rate of the MSA the respondent lives in. Column (3) regresses it on both the unemployment and job turnover rates. Column (4) and (5) regress it on the MSA's job creation and job destruction rates introduced separately, respectively with and without a control for the MSA's unemployment rate. Standard errors are clustered at the MSA level. Year and month fixed effects are included in each regression. Panel A does not include any individual-level controls. Panel B includes basic demographic controls: age, age square, a dummy for being female, a dummy for being married or having a partner, a dummy for having some college or more and race dummies (black, asian, hispanic). Panel C adds 8 dummies for income brackets. All regressions are weighted by individual weights attached by the BRFSS to each respondent.

Table 5: Individual-level results; Gallup data - Current ladder

VARIABLES	(1)	(2)	(3) Current ladder	(4)	(5)
			Panel A: Without individual controls		
Unemployment rate	-3.020***		-3.600***		-3.426***
	(0.505)		(0.509)		(0.501)
Job turnover rate		0.339	1.034***		
		(0.299)	(0.279)		
Job creation rate				1.837***	1.614***
				(0.524)	(0.414)
Job destruction rate				-0.905***	0.491*
				(0.332)	(0.279)
Year and Month F.E.	x	x	x	x	x
Observations	668,386	668,386	668,386	668,386	668,386
R-squared	0.008	0.007	0.008	0.007	0.008
			Panel B: With individual level controls (age, education, race, gender, marital status)		
Unemployment rate	-2.456***		-2.878***		-2.704***
	(0.422)		(0.431)		(0.437)
Job turnover rate		0.254	0.752***		
		(0.246)	(0.230)		
Job creation rate				1.560***	1.224***
				(0.440)	(0.352)
Job destruction rate				-0.764***	0.331
				(0.289)	(0.267)
Year and Month F.E.	x	x	x	x	x
Observations	502,334	502,334	502,334	502,334	502,334
R-squared	0.058	0.058	0.059	0.058	0.059
			Panel C: All individual level controls of Panel B + income		
Unemployment rate	-2.233***		-2.257***		-2.151***
	(0.402)		(0.422)		(0.440)
Job turnover rate		-0.354	0.0405		
		(0.228)	(0.210)		
Job creation rate				0.587	0.330
				(0.371)	(0.325)
Job destruction rate				-1.088***	-0.218
				(0.317)	(0.305)
Year and Month F.E.	x	x	x	x	x
Observations	416,788	416,788	416,788	416,788	416,788
R-squared	0.103	0.102	0.103	0.102	0.103

Note: The dependent variable is the Cantril ladder of life from Gallup over the periode 2008-2011. Column (1) regresses it on the unemployment rate of the MSA the respondent lives in. Column (2) regresses it on the job turnover rate of the MSA the respondent lives in. Column (3) regresses it on both the unemployment and job turnover rates. Column (4) and (5) regress it on the MSA's job creation and job destruction rates introduced separately, respectively with and without a control for the MSA's unemployment rate. Standard errors are clustered at the MSA level. Year and month fixed effects are included in each regression. Panel A does not include any individual-level controls. Panel B includes basic demographic controls: age, age square, a dummy for being female, a dummy for being married or having a partner, a dummy for having some college or more and race dummies (black, asian, hispanic). Panel C adds 9 dummies for income brackets. All regressions are weighted by individual weights attached by Gallup to each respondent.

Table 6: Individual-level results; Gallup data - Anticipated ladder

	(1)	(2)	(3)	(4)	(5)
VARIABLES			Anticipated ladder		
Panel A: Without individual controls					
Unemployment rate	-0.675		-1.785***		-1.663***
	(0.493)		(0.435)		(0.427)
Job turnover		1.632***	1.974***		
		(0.240)	(0.259)		
Job creation rate				2.488***	2.379***
				(0.396)	(0.346)
Job destruction rate				0.921***	1.595***
				(0.319)	(0.339)
Year and Month F.E.	x	x	x	x	x
Observations	650,625	650,625	650,625	650,625	650,625
R-squared	0.003	0.004	0.004	0.004	0.004
Panel B: With individual level controls (age, education, race, gender, marital status)					
Unemployment rate	0.108		-0.705**		-0.677**
	(0.357)		(0.307)		(0.307)
Job turnover rate		1.319***	1.441***		
		(0.154)	(0.151)		
Job creation rate			1.602***	1.517***	
				(0.275)	(0.259)
Job destruction rate				1.099***	1.373***
				(0.230)	(0.218)
Year and Month F.E.	x	x	x	x	x
Observations	490,086	490,086	490,086	490,086	490,086
R-squared	0.077	0.077	0.077	0.077	0.077
Panel C: All individual level controls of Panel B + income					
Unemployment rate	0.283		-0.306		-0.308
	(0.288)		(0.295)		(0.301)
Job turnover		0.993***	1.046***		
		(0.133)	(0.143)		
Job creation rate				1.078***	1.041***
				(0.255)	(0.248)
Job destruction rate				0.927***	1.051***
				(0.207)	(0.224)
Year and Month F.E.	x	x	x	x	x
Observations	408,557	408,557	408,557	408,557	408,557
R-squared	0.091	0.091	0.091	0.091	0.091

Note: The dependent variable is the anticipated Cantril ladder from Gallup over the periode 2008-2011. Column (1) regresses it on the unemployment rate of the MSA the respondent lives in. Column (2) regresses it on the job turnover rate of the MSA the respondent lives in. Column (3) regresses it on both the unemployment and job turnover rates. Column (4) and (5) regress it on the MSA's job creation and job destruction rates introduced separately, respectively with and without a control for the MSA's unemployment rate. Standard errors are clustered at the MSA level. Year and month fixed effects are included in each regression. Panel A does not include any individual-level controls. Panel B includes basic demographic controls: age, age square, a dummy for being female, a dummy for being married or having a partner, a dummy for having some college or more and race dummies (black, asian, hispanic). Panel C adds 9 dummies for income brackets. All regressions are weighted by individual weights attached by Gallup to each respondent.

Table 7: Individual-level results; Gallup data - Worry

VARIABLES	(1)	(2)	(3) Worry	(4)	(5)
Panel A: Without individual controls					
Unemployment rate	0.531***		0.481***		0.477***
	(0.0736)		(0.0767)		(0.0774)
Job turnover rate		0.181***	0.0878*		
		(0.0486)	(0.0455)		
Job creation rate				0.0413	0.0721
				(0.0752)	(0.0630)
Job destruction rate				0.297***	0.103*
				(0.0578)	(0.0557)
Year and month F.E.	x	x	x	x	x
Observations	669,605	669,605	669,605	669,605	669,605
R-squared	0.001	0.001	0.001	0.001	0.001
Panel B: With individual level controls (age, education, race, gender, marital status)					
Unemployment rate	0.420***		0.367***		0.357***
	(0.0715)		(0.0759)		(0.0784)
Job turnover rate		0.159***	0.0954**		
		(0.0419)	(0.0408)		
Job_creation rate				0.0249	0.0693
				(0.0747)	(0.0672)
Job destruction rate				0.263***	0.119**
				(0.0554)	(0.0569)
Year and month F.E.	x	x	x	x	x
Observations	503,159	503,159	503,159	503,159	503,159
R-squared	0.014	0.013	0.014	0.014	0.014
Panel C: All individual level controls of Panel B + income					
Unemployment rate	0.354***		0.241***		0.245***
	(0.0805)		(0.0821)		(0.0846)
Job turnover		0.244***	0.201***		
		(0.0436)	(0.0425)		
Job creation rate				0.184**	0.213***
				(0.0715)	(0.0683)
Job destruction rate				0.290***	0.191***
				(0.0609)	(0.0610)
Year and month F.E.	x	x	x	x	x
Observations	417,224	417,224	417,224	417,224	417,224
R-squared	0.033	0.033	0.033	0.033	0.033

Note: The dependent variable is the Gallup measure of worry over the periode 2008-2011. Column (1) regresses it on the unemployment rate of the MSA the respondent lives in. Column (2) regresses it on the job turnover rate of the MSA the respondent lives in. Column (3) regresses it on both the unemployment and job turnover rates. Column (4) and (5) regress it on the MSA's job creation and job destruction rates introduced separately, respectively with and without a control for the MSA's unemployment rate. Standard errors are clustered at the MSA level. Year and month fixed effects are included in each regression. Panel A does not include any individual-level controls. Panel B includes basic demographic controls: age, age square, a dummy for being female, a dummy for being married or having a partner, a dummy for having some college or more and race dummies (black, asian, hispanic). Panel C adds 9 dummies for income brackets. All regressions are weighted by individual weights attached by Gallup to each respondent.

Table 8: Robustness checks - Longitudinal Employer Household data

VARIABLES	(1)	(2)	(3)	(4)	(5)
Panel A : "How satisfied are you with your life?" (BRFSS)					
Unemployment rate	-1.790***		-2.043***		-1.934***
	(0.251)		(0.218)		(0.228)
Job turnover rate (all jobs)		0.135*	0.256***		
		(0.0713)	(0.0601)		
Job turnover rate (stable jobs)				0.222**	0.308***
				(0.0892)	(0.0758)
Observations	357	357	357	357	357
R-squared	0.282	0.027	0.374	0.048	0.371
Panel B : Current ladder of life (Gallup)					
Unemployment rate	-3.546***		-3.764***		-3.548***
	(0.564)		(0.535)		(0.561)
Job turnover rate (all jobs)		0.392***	0.591***		
		(0.142)	(0.149)		
Job turnover rate (stable jobs)				0.340	0.345
				(0.259)	(0.239)
Observations	359	359	359	359	359
R-squared	0.197	0.017	0.234	0.008	0.205

Note: The dependent variables are MSA-level weighted averages of life satisfaction measures, coming either from the BRFSS (Panel A) or from Gallup (Panel B). The weights used to compute the MSA-level averages are the weights attached to each respondent by either the BRFSS or Gallup. The sample years are 2005-2010 for BRFSS and 2008-2011 for Gallup. The independent variables are averages across either 2005-2010 (Panel A) or 2008-2011 (Panel B) of MSA-level unemployment rates (column 1, 3 and 5), and job turnover rates (column 2, 3, 4 and 5). The unemployment rates come from the Bureau of Labor Statistics (Local Area Unemployment Statistics). The job turnover rates come from the Longitudinal Employer Household Dynamics Data . Job turnover is defined as the sum of the job creation rate and the job destruction rate. The job creation (destruction) rate is the sum of all employment gains (losses) from year (t-1) to year t, divided by the average employment in year t and (t-1). The job turnover for stable jobs is defined similarly exept that only jobs that lasted more than one quarter are counted. There is no additional control besides the coefficient displayed. In each regression MSAs are weighted by the sum of the weights of respondents in that MSA.

Table 9: Robustness checks - Predicted turnover rate

	(1)	(2)	(3)	(4)
VARIABLES	"How satisfied are you with your life?"			
	Panel A : Stable jobs			
Job turnover rate	0.246***	0.145***		
	(0.0517)	(0.0470)		
Predicted turnover rate			0.494***	0.960**
			(0.124)	(0.467)
Unemployment rate	-0.808***	-0.728***	-0.990***	-0.756***
	(0.131)	(0.144)	(0.123)	(0.147)
Initial Sectoral composition		x		x
Individual controls	x	x	x	x
Year and month F.E.	x	x	x	x
Observations	837,897	834,671	837,897	834,671
R-squared	0.074	0.075	0.074	0.074
	Panel B : All jobs			
Job turnover rate	0.223***	0.158***		
	(0.0341)	(0.0379)		
Predicted turnover rate			0.298***	0.686**
			(0.0777)	(0.337)
Unemployment rate	-0.883***	-0.717***	-1.015***	-0.753***
	(0.122)	(0.143)	(0.126)	(0.147)
Initial Sectoral composition		x		x
Individual controls	x	x	x	x
Year and month F.E.	x	x	x	x
Observations	837,897	834,671	837,897	834,671
R-squared	0.074	0.075	0.074	0.074

Note: The dependent variable is the BRFSS measure of life satisfaction over the periode 2005-2010. The predicted variable is defined as follows: we take job turnover rates by sector at the national level from the Longitudinal Employer Household Survey, and for each MSA we compute a weighted average of these national sectoral rates where weights correspond to the share of the MSA's total employment that the sector represents. The sectoral composition of employment by MSA used for the weights comes from the Statistics of US Businesses from the Census. Column (3) and (4) are the main columns of interest which display the coefficient of the predicted job turnover rate, respectively without and with controls for the sectoral weights. As a benchamrk, column (1) shows the result when the independent variable is the actual job turnover rate from the Longitudinal Employer Household Survey and column (2) shows what happens to this benchmark when we add controls for the sectoral composition. All regressions include year and month fixed effect, the MSA's unemployment rate and individual controls (gender, age, age square, seven dummies for education, seven dummies for family/marital status and nine dummies for race). Standard errors are clustered at the MSA-level.

Table 10: Interactions with productivity growth

VARIABLES	(1)	(2)	(3)	(4)
	Life satisfaction (BRFSS)			
Panel A: Fixed sectoral composition (2005)				
Above median * Job turnover	0.190**	0.160**		
	(0.0755)	(0.0757)		
Above median * Job creation			0.267**	0.278***
			(0.106)	(0.106)
Above median * Job destruction			0.0661	0.00111
			(0.113)	(0.114)
Job turnover rate	0.0727	0.139**		
	(0.0611)	(0.0617)		
Job creation rate			0.293***	0.183**
			(0.0927)	(0.0930)
Job destruction rate			-0.149	0.0973
			(0.0966)	(0.101)
Above median TFP growth	-0.0603***	-0.0551**	-0.0542**	-0.0496**
	(0.0215)	(0.0215)	(0.0214)	(0.0215)
Unemployment rate		x		x
Individual controls	x	x	x	x
Year and Month F.E.	x	x	x	x
Observations	707,362	707,362	707,362	707,362
R-squared	0.073	0.074	0.073	0.074
Panel B : Time-varying sectoral composition (2005-2009)				
Above median * Job turnover	0.206***	0.215***		
	(0.0783)	(0.0782)		
Above median * Job creation			0.303***	0.349***
			(0.108)	(0.108)
Above median * Job destruction			0.0764	0.0283
			(0.118)	(0.118)
Job turnover rate	0.0594	0.102		
	(0.0659)	(0.0663)		
Job creation rate			0.270***	0.135
			(0.0958)	(0.0963)
Job destruction rate			-0.156	0.0879
			(0.105)	(0.109)
Above median TFP growth	-0.0630***	-0.0688***	-0.0585***	-0.0615***
	(0.0221)	(0.0221)	(0.0221)	(0.0221)
Unemployment rate		x		x
Individual controls	x	x	x	x
Year and Month F.E.	x	x	x	x
Observations	708,061	708,061	708,061	708,061
R-squared	0.073	0.074	0.073	0.074

Note: The dependent variable is the BRFSS measure of life satisfaction over the periode 2005-2010. The independent variables are measures of creative destruction from the Business Dynamics Statistics (either the job creation rate and the job destuction rate or the sum of the two), a measure of whether predominant sectors in the MSA experience more or less productivity growth and interaction terms between the creative destruction variables and the productivity growth measure. The productivity growth measure of an MSA is computed as follows: we take the 5 factors TFP annual growth by sector at the national level from the NBER-CES Manufacturing Industry Database (which is only available until 2009 so we use an average over 2005-2009), and for each MSA we compute a weighted average of these national sectoral rates where weights correspond to the share of the MSA's total employment that the sector represents. The sectoral composition of employment by MSA used for the weights comes from the Statistics of US Businesses from the Census. Panel A uses fixed weights from 2005, whereas Panel B uses time-varying weights. Column (1) and (2) use the job turnover rate (the sum of the job creation and the job destruction rate) whereas column (3) and (4) introduce the job creation and the job destruction rate separately. Column(2) and (4) control for the MSA's unemployment rate whereas column(1) and (3) do not. Standard errors are clustered at the MSA level. Year and month fixed effects are introduced in all regressions as well as individual controls: age, age square, a dummy for being female, nine race dummies, seven education dummies and seven dummies for the mariatal/family status.

Table 11: Interactions with outsourcing threat

	(1)	(2)	(3)	(4)
VARIABLES	"How satisfied are you with your life?" (BRFSS)			
Above median * Job turnover	-0.0834	-0.113*		
	(0.0661)	(0.0661)		
Above median * Job creation			-0.0347	-0.0554
			(0.0906)	(0.0906)
Above median * Job destruction			-0.140	-0.185*
			(0.100)	(0.100)
Job turnover rate	0.158***	0.235***		
	(0.0441)	(0.0446)		
Job creation rate			0.352***	0.280***
			(0.0696)	(0.0696)
Job destruction rate			-0.0495	0.186**
			(0.0784)	(0.0810)
Outsourcing above median	0.0412**	0.0476**	0.0419**	0.0496***
	(0.0188)	(0.0188)	(0.0189)	(0.0189)
Unemployment rate		x		x
Individual controls	x	x	x	x
Year and Month F.E.	x	x	x	x
Observations	852,783	852,783	852,783	852,783
R-squared	0.074	0.074	0.074	0.074

Note: The depdendent variable is the BRFSS measure of life satisfaction over the periode 2005-2010. The independent variables are measures of creative destruction from the Business Dynamics Statistics (either the job creation rate and the job destruction rate or the sum of the two), a measure of whether predominant sectors in the MSA are more or less prone to outsource their activity and interaction terms between the creative destruction variables and the measure of the outsourcing threat. The outsourcing threat measure of an MSA is computed as follows: following Autor et al. (AER, 2013), we take the growth of imports from China by sectors, and for each MSA we compute a weighted average of these national sectoral import growth rates where weights correspond to the share of the MSA's total employment that the sector represents. The sectoral composition of employment by MSA used for the weights comes from the Statistics of US Businesses from the Census. Column (1) and (2) use the job turnover rate (the sum of the job creation and the job destruction rate) whereas column (3) and (4) introduce the job creation and the job destruction rate separately. Column(2) and (4) control for the MSA's unemployment rate whereas column(1) and (3) do not. Standard errors are clustered at the MSA level. Year and Month fixed effects are introduced in all regressions as well as individual controls: age, age square , a dummy for being female, nine race dummies, seven education dummies and seven dummies for the mariatal/family status.