Migrants' Networks:An Estimable Model fo Illegal Mexican Immigration

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- This paper analyzes the network effect of the Mexican immigrants in the U.S. The U.S. wage offer probability depends on the number of Mexican immigrants in the U.S.
- The author calibrates the dynamic model with migration and return migraction.
- The parameters of the model are calibrated to the time series of the immigration rate from 1965 when there was very small number of immigrants.

Model

Network Effect

An individual with age a receives a job offer from Mexico with probability 1, and from the U.S. with the probability

$$p(a) = p\left(x(a), N_{t-1}^{US}\right)$$

where
$x(a)$: years of experience in the U.S.
N_{t-1}^{US}: Number of total people in the U.S. from the individual's village: Network Effect.

Wage Offer

The wage offer at location $l \in \{U.S., Mexico\}$:

$$w_{it}^{l}(a) = r_t^{l} s_i^{l}(a_{it})$$

r_t^{l}: rental price of skill
$s_i^{l}(a_{it})$: skill level of individual i at time t.

$$s_i^{l}(a_{it}) = exp\left(\alpha_0^{l} + \alpha_1^{l} a_{it} + \alpha_2^{l} a_{it}^2 + \epsilon_i^{l}\right)$$

ϵ_i^{l}: idiosyncratic wage shock.

Per Period Utility

$$u(a) = d(a)u^{us}(a) + [1 - d(a)]\, u^{mx}(a) - d(a)\,[1 - d(a-1)]\, C$$

C: border crossing cost.

$$\begin{aligned} u^{mx}(a) &= w^{mx} \\ u^{us}(a) &= w^{us}\phi\,(z(a), a) \end{aligned}$$

$\phi()$: psychic cost of being in the U.S.
$z(a)$: tenure in the U.S. (number of periods continuously in the U.S.)

Dynamic Choice of Individuals

State Space:

$$\Omega_t(a) = \{r_t^{us}, r_t^{mx}, N_t^{us}, x(a), z(a), \rho_t, \epsilon^{us}(a), \epsilon_{mx}(a)\}$$

Value of being in the U.S.

$$V_t^{us}\left(\Omega_t(a), a\right) = w_t^{us}(a)\phi(a)$$

$$+\delta E_t\left[Max\left\{V_{t+1}^{us}(a+1), V_{t+1}^{mx}(a+1)\right\}|\Omega_t(a), d(a)=1\right]$$

Value of being in Mexico

$$\begin{aligned} & V_t^{mx}\left(\Omega_t(a), a\right) \\ = \quad & w_t^{mx}(a)\phi(a) \\ & +\delta E_t\left[p_{t+1}(a+1)Max\left\{V_{t+1}^{us}(a+1)-C, V_{t+1}^{mx}(a+1)\right\}\right. \\ & \left.+\left(1-p_{t+1}(a+1)\right)V_{t+1}^{mx}(a+1)|\Omega_t(a), d(a)=1\right] \end{aligned}$$

- If the immigrant is in the U.S., it automatically receives an offer from both U.S. and Mexico.
- If the individual is in Mexico, it only receives the U.S. offer with probability $p(a)$, which is a function of the network effect.

Rental Price of Skills

U.S.

The rental price of skill $s_i^{us}(a_{it})$ is exogenous.

$$logr_t^{us} = \mu + \theta logr_{t-1}^{us} + \xi_t^{us}$$

Mexico

The rental price of skill from the village in Mexico comes from the Cobb-Douglass production function.

$$Y_t = \gamma exp\left(\lambda \rho_t\right)\left(S_t^{mx}\right)^{\alpha}$$

ρ_t: period t rainfall
S_t^{mx}: Aggregate stock of skill in Mexico

$$S_t^{mx} = \sum_{a=15}^{64} \sum_{i} s_i^{mx}(a_{it})\left(1 - d_i(a_{it})\right)$$

rental rate

$$r_t^{mx} = \alpha \gamma exp\left(\lambda \rho_t\right)\left(S_t^{mx}\right)^{\alpha-1}$$

Equilibrium

Rental rate r_t^{mx} satisfies labor supply equals labor demand.

- Labor supply in Mexican village

$$S_t^{mx} = \sum_{a=15}^{64} \sum_i s_i^{mx}(a_{it})\,(1 - d_i(a_{it}))$$

  where $d_i(a_{it})$ satisfies individual optimal choice

- Labor demand in Mexican village

$$r_t^{mx} = \alpha\gamma exp\,(\lambda\rho_t)\,(S_t^{mx})^{\alpha-1}$$

Assume that the equilibrium rantal rate follows

$$\frac{r_t^{mx}}{\bar{r}} = logit\left(\beta_{11} r_t^{us} + \beta_{12}\rho_t + \beta_{13} r_{t-1}^{mx} + \beta_{14} N_{t-1}^{us}\right)$$

$$\frac{N_t^{us}}{N_t} = logit\left(\beta_{21} r_t^{us} + \beta_{22}\rho_t + \beta_{23} r_{t-1}^{mx} + \beta_{24} N_{t-1}^{us}\right)$$

Then, compute the coefficient that approximately satisfy the equilibrium conditions.

Data

- Mexican Migration Project Data
- 1987-, conducts interviews in a number of villages in Mexico, on demographics, retrospective migration and occupation histories.
- Sample: male household heads at least 15 years of age at the time of survey.
- villages: Primarily agricultural with population less than 3,0000 in 1950.

Calibration

Parameters are chosen to match the percentage of migrants, wages, by year, age of individuals in one of the three villages.
Earnings function:

$$s_i^{us}(a_{it}) = exp\left(3.864 + 0.0000_{it}^{a} + 0.0000a_{it}^2 + \epsilon_i^{us}\right)$$

$$s_i^{mx}(a_{it}) = exp\left(3.864 + 0.0000_{it}^{a} + 0.0000a_{it}^2 + \epsilon_i^{mx}\right)$$

Psychic cost:
Type 1

$$\phi_1(z(a), a) = 0.5z(a) + 0.01a$$

Type 2

$$\phi_2(z(a), a) = 2.1z(a) + 0.01a$$

Standard error of idiosyncratic wage shocks.

$$\sigma^{us} = 0.65,\ \sigma^{mx} = 0.5$$

Production function

$$Y_t = 20.5 exp\left(0.0003\rho_t\right)\left(S_t^{mx}\right)^{0.9}$$

Border crossing cost

$$C = 100.0$$

U.S. skill rental price

$$logr_t^{us} = 0.41 + 0.875 logr_{t-1}^{us} + \xi_t^{us},\ \sigma_\xi = 0.068$$

Type 1 proportion: 0.4

Model Fit

The model fits the percentage of migrants in the U.S. from 1965, by year and by age reasonably well. It also roughly matches the wage offer and the tenure in the U.S.

Policy: Eliminate Network Effect

- Without network effect, the rate of increase in immigration decreases over time, in contrast to the results with network effect, where there is an initial increase in the rate.
- The steady state with network effect exhibits more volatility.

Policy: Increase Border Cost

- Does not change the steady state ratio of imigrants.
- Immigrants increase the length of stay in the U.S.

Policy: 10 Percent Wage Reduction

- Reduces the steady state number of immigrants by 40%

Figure 1: Rain Fall (Annual Precipitations in mm)

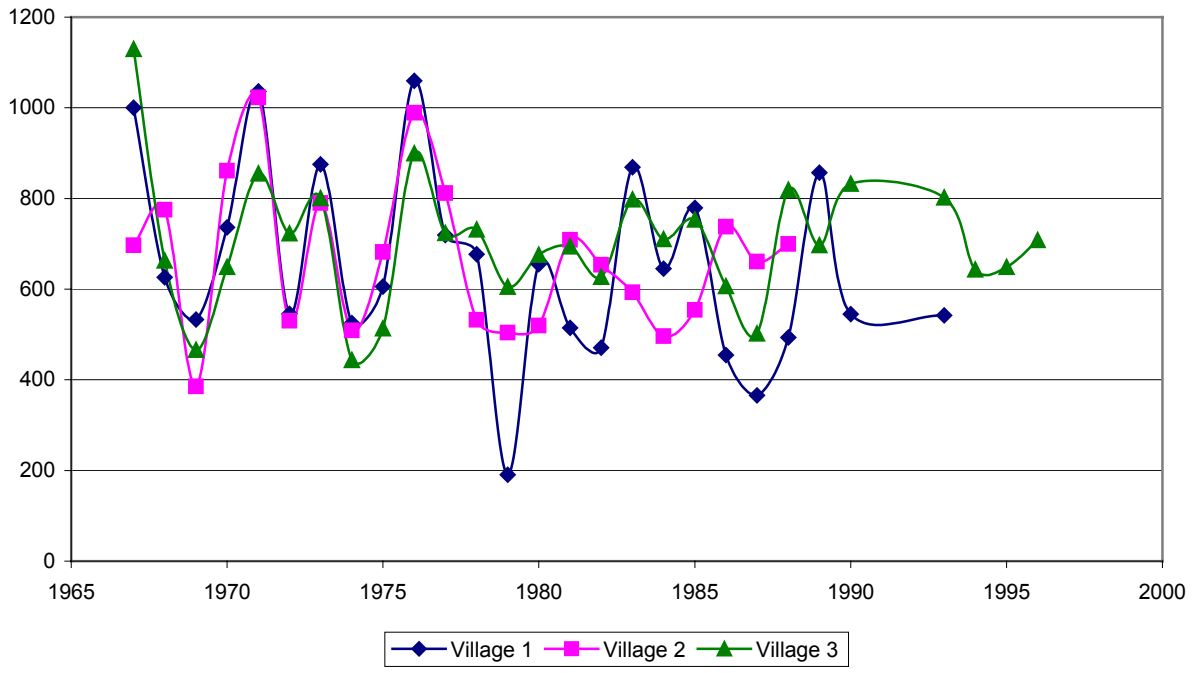
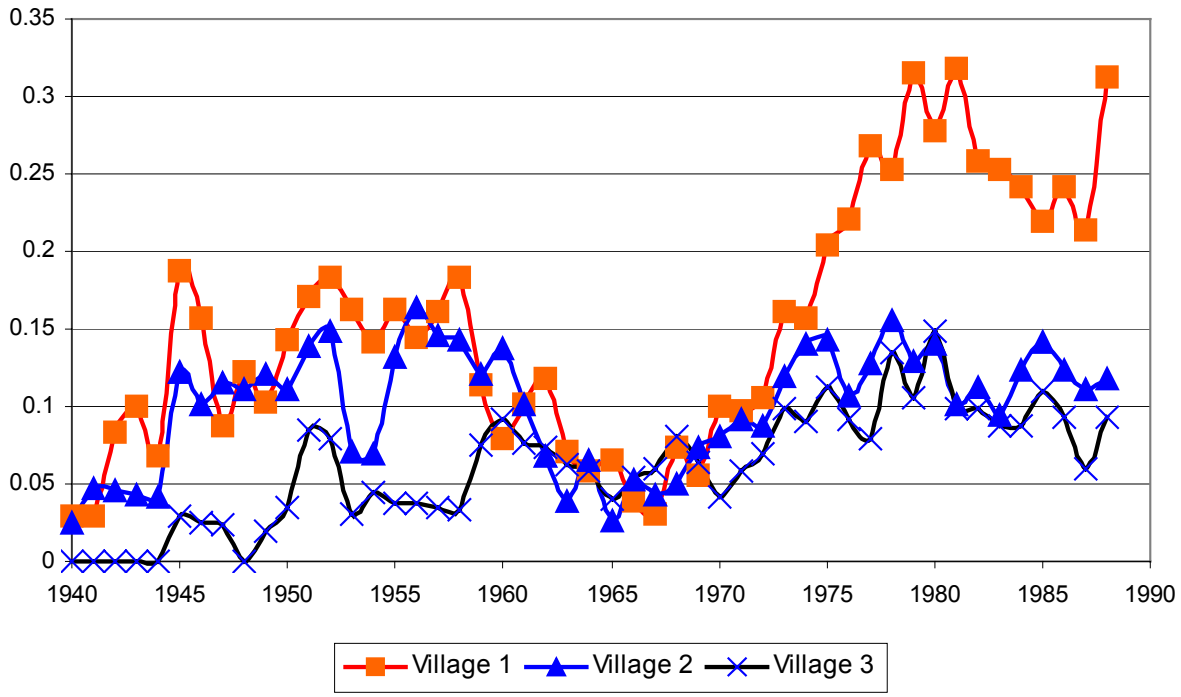


Figure 2: Percentage of Migrants in the U.S. by Year



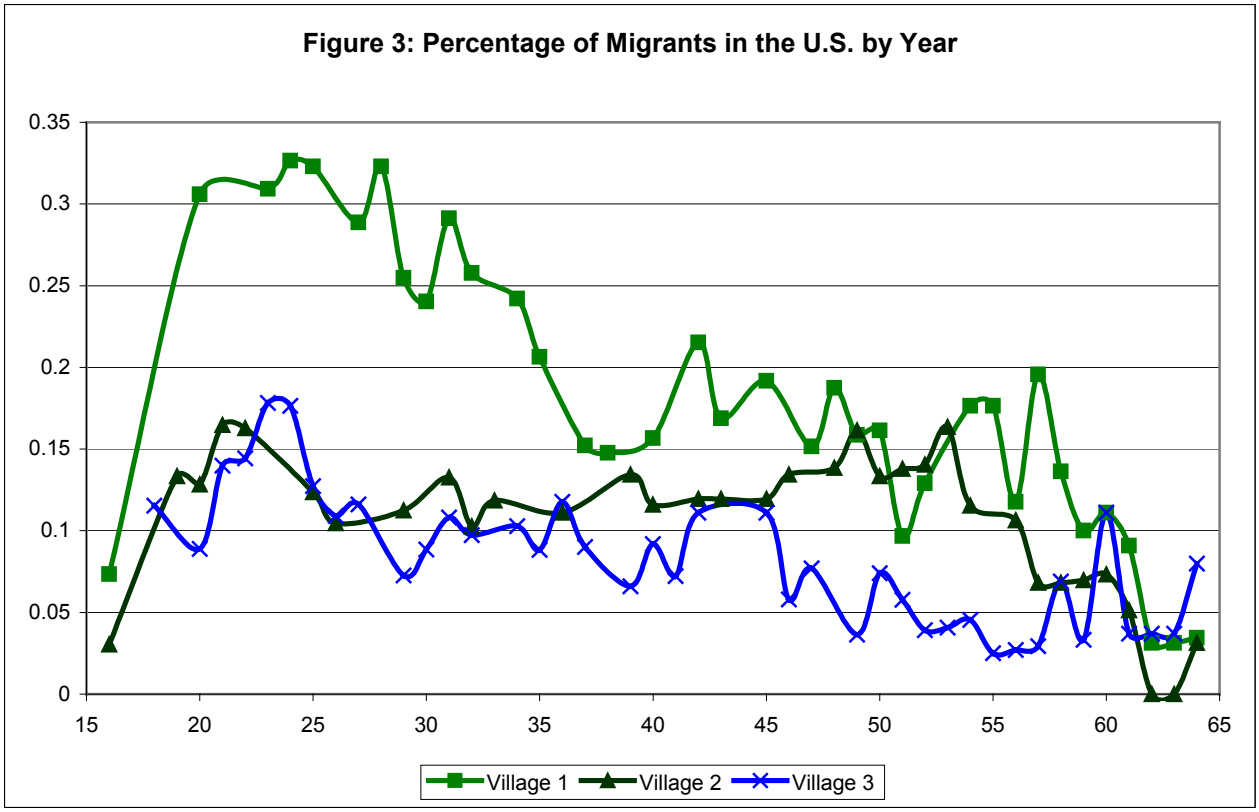


Figure 3: Percentage of Migrants in the U.S. by Year
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
15
20
25
30
35
40
45
50
55
60
65
Village 1
Village 2
Village 3

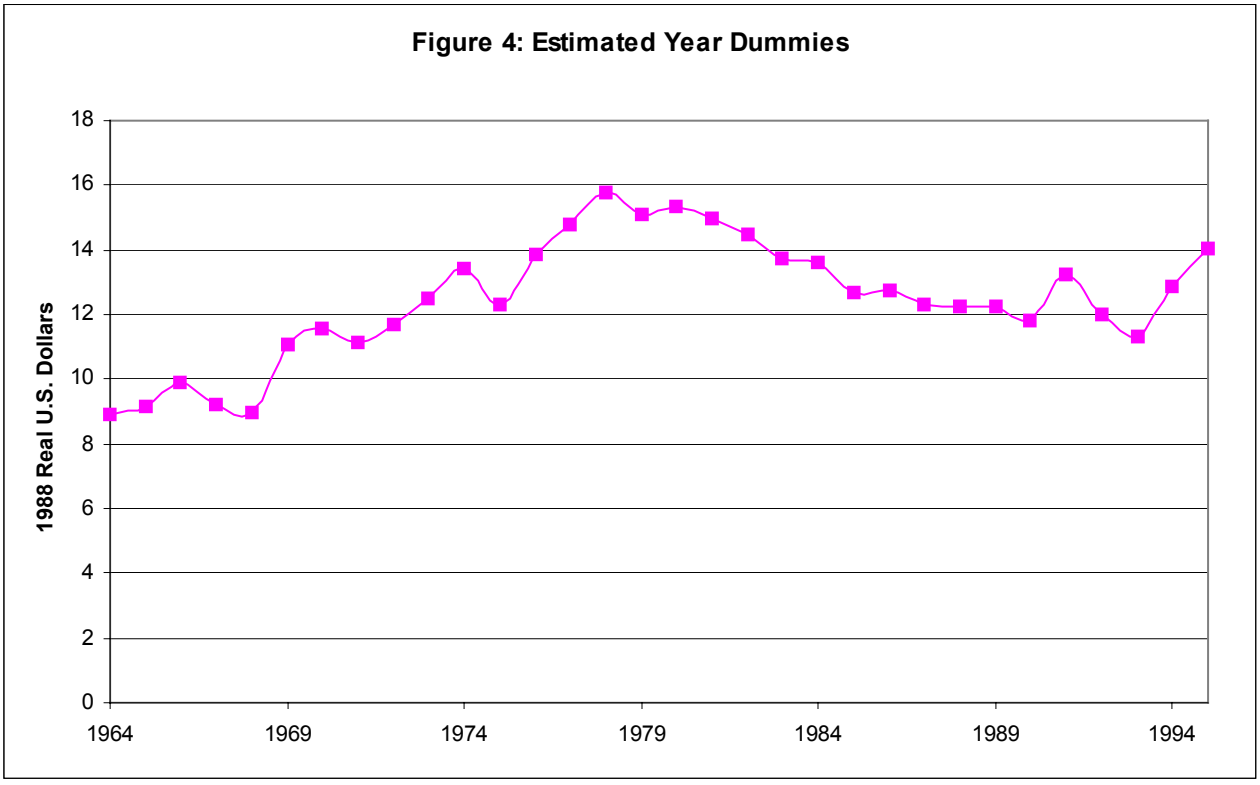


Figure 4: Estimated Year Dummies
1988 Real U.S. Dollars
18
16
14
12
10
8
6
4
2
0
1964
1969
1974
1979
1984
1989
1994

Figure 5: 1988 MX Peso - US Dollar Real Exchange Rate

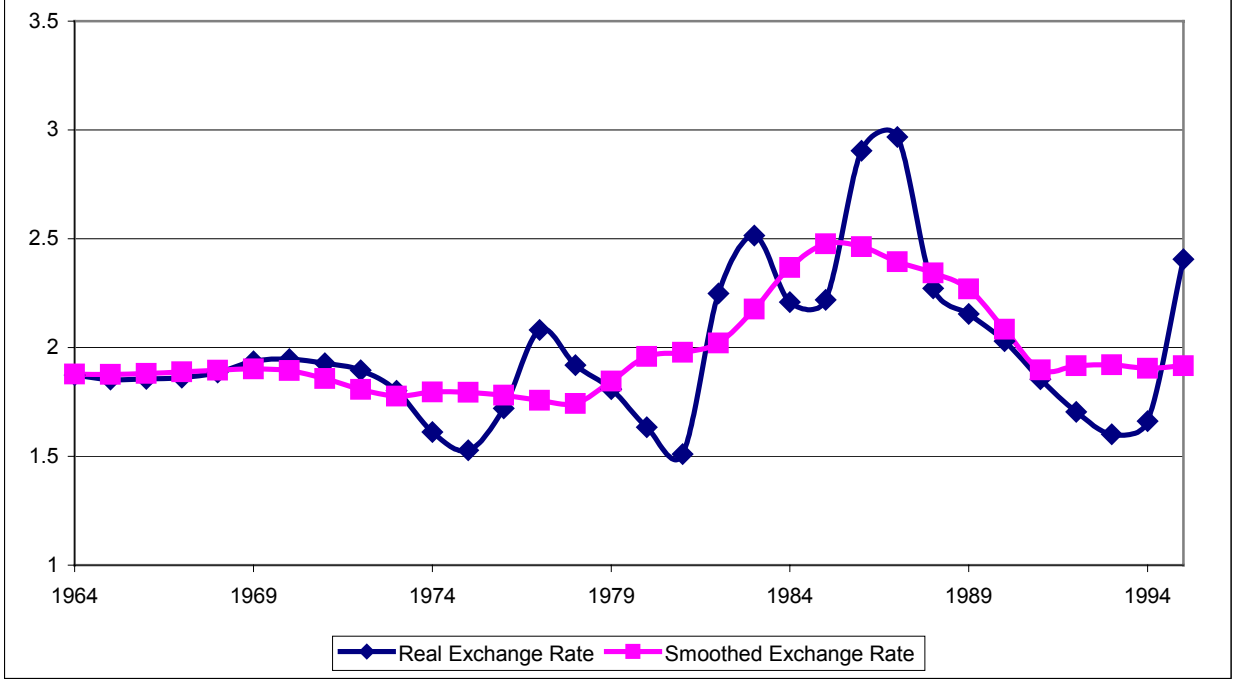


Figure 6: Village 1 - Percentage of Migrants in the U.S. by Year

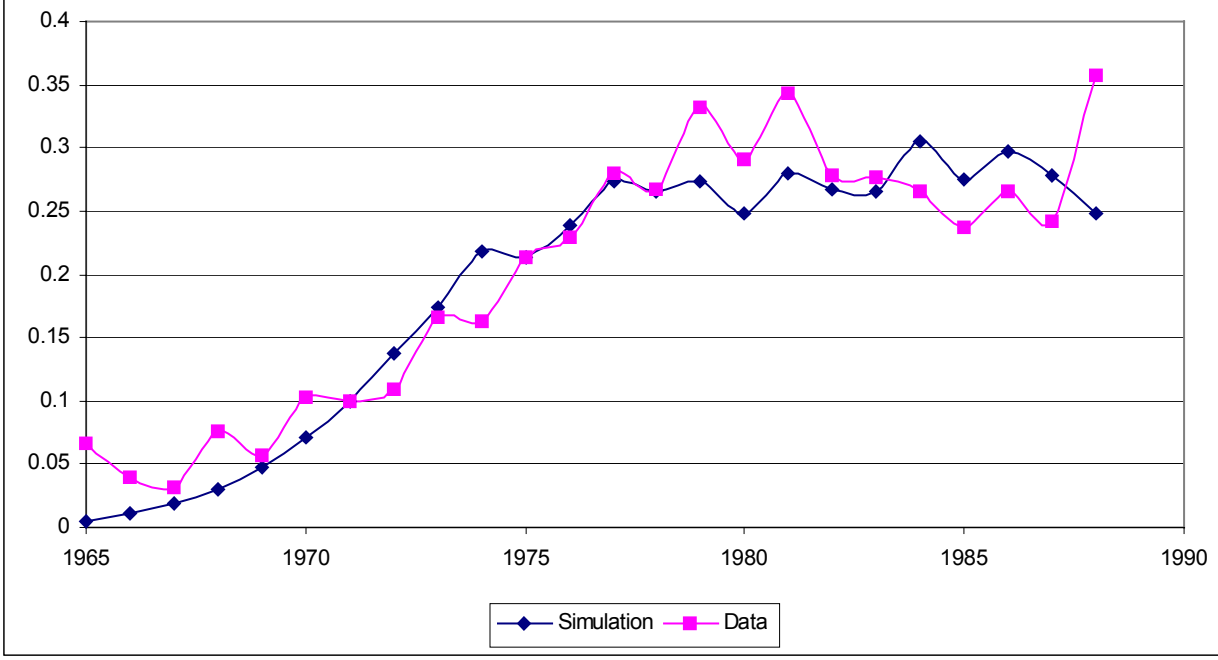


Figure 7: Village 1 - Percentage of Migrants in the U.S. by Age

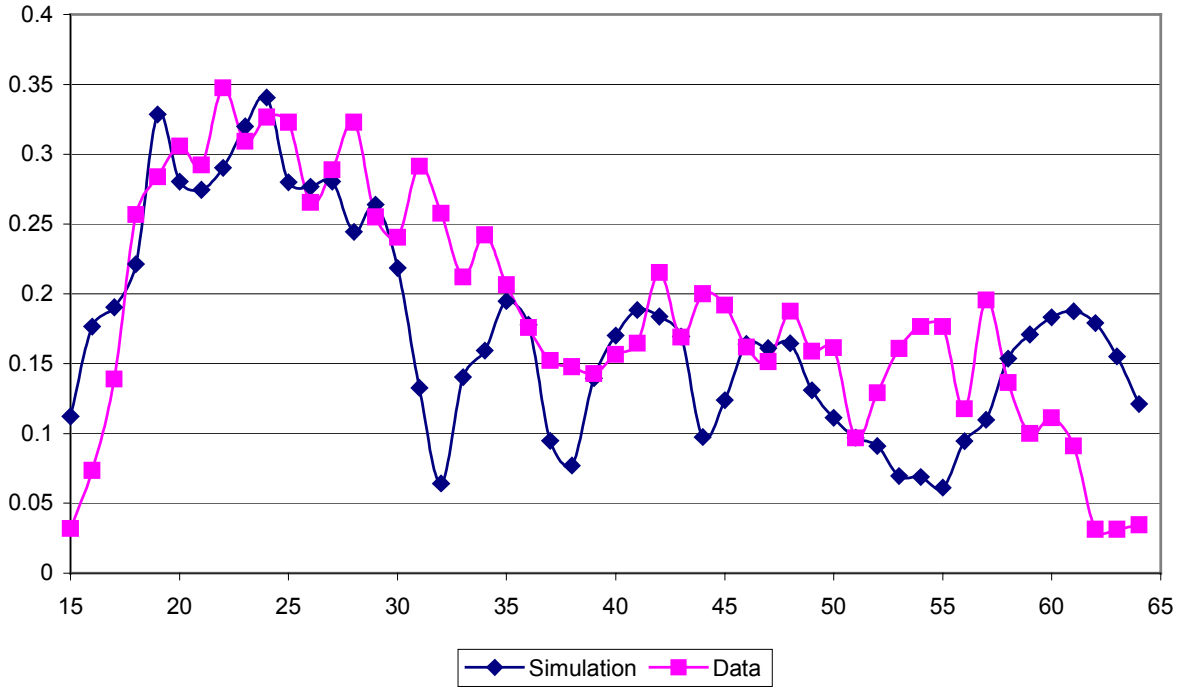
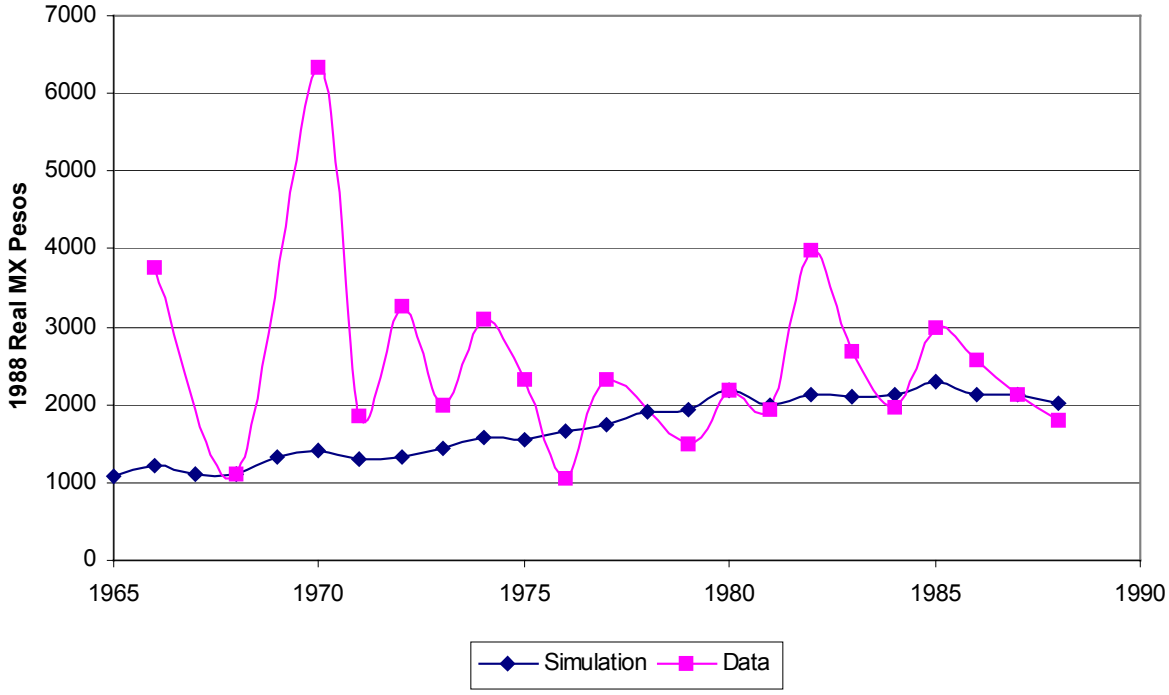


Figure 8: Mean U.S. Accepted Wages by Year



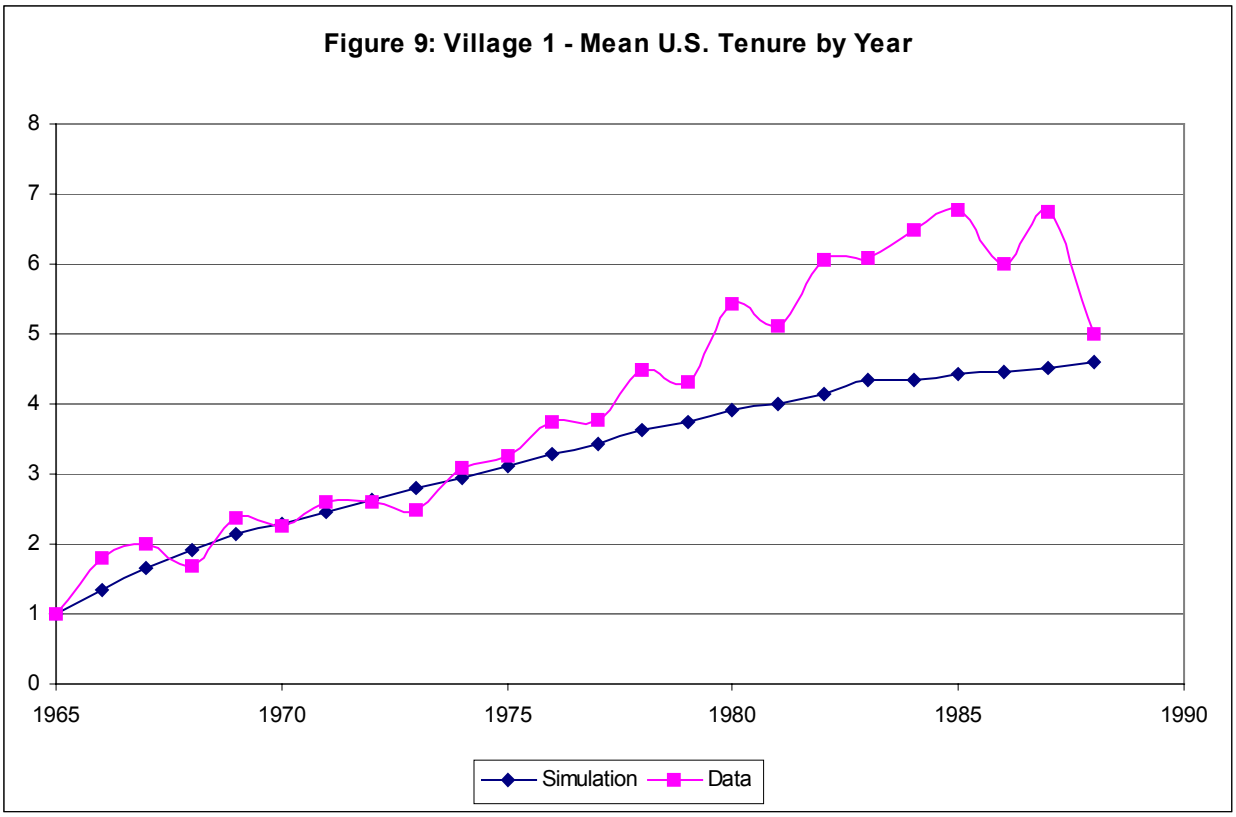


Figure 9: Village 1 - Mean U.S. Tenure by Year
8
7
6
5
4
3
2
1
0
1965
1970
1975
1980
1985
1990
Simulation
Data

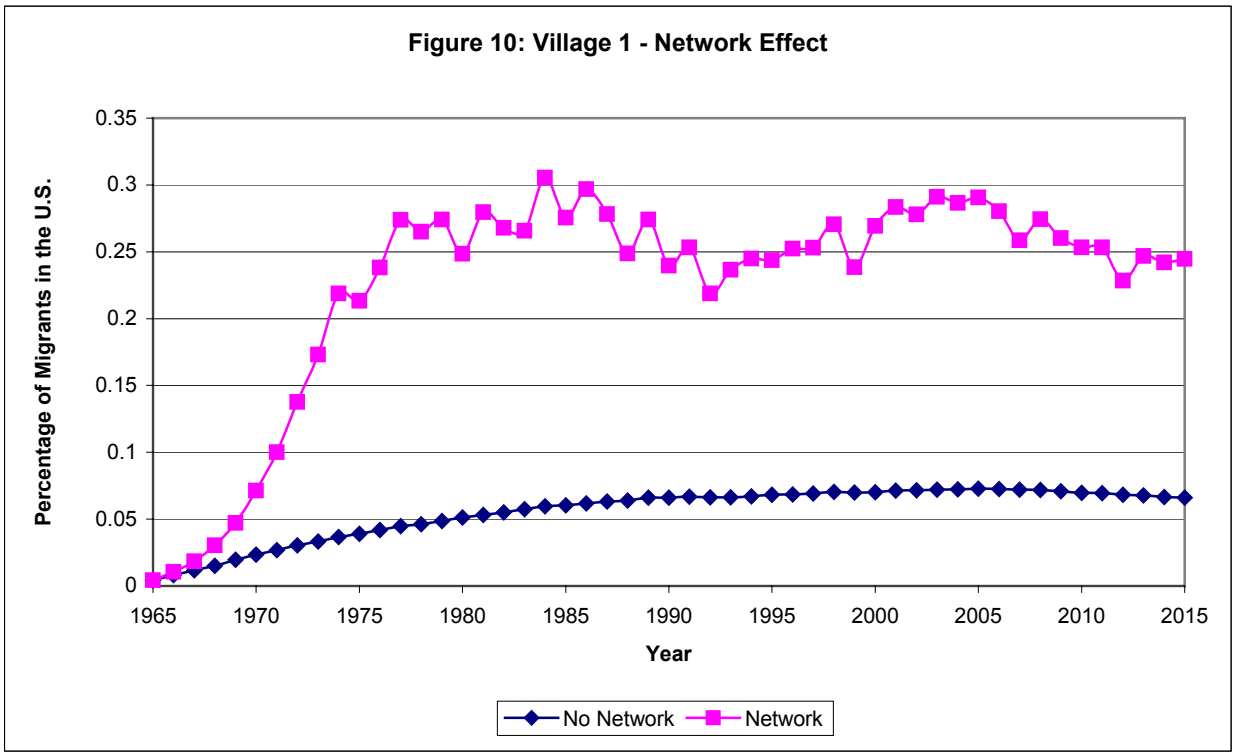


Figure 10: Village 1 - Network Effect
Percentage of Migrants in the U.S.
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
No Network
Network

Figure 11: Network Effect

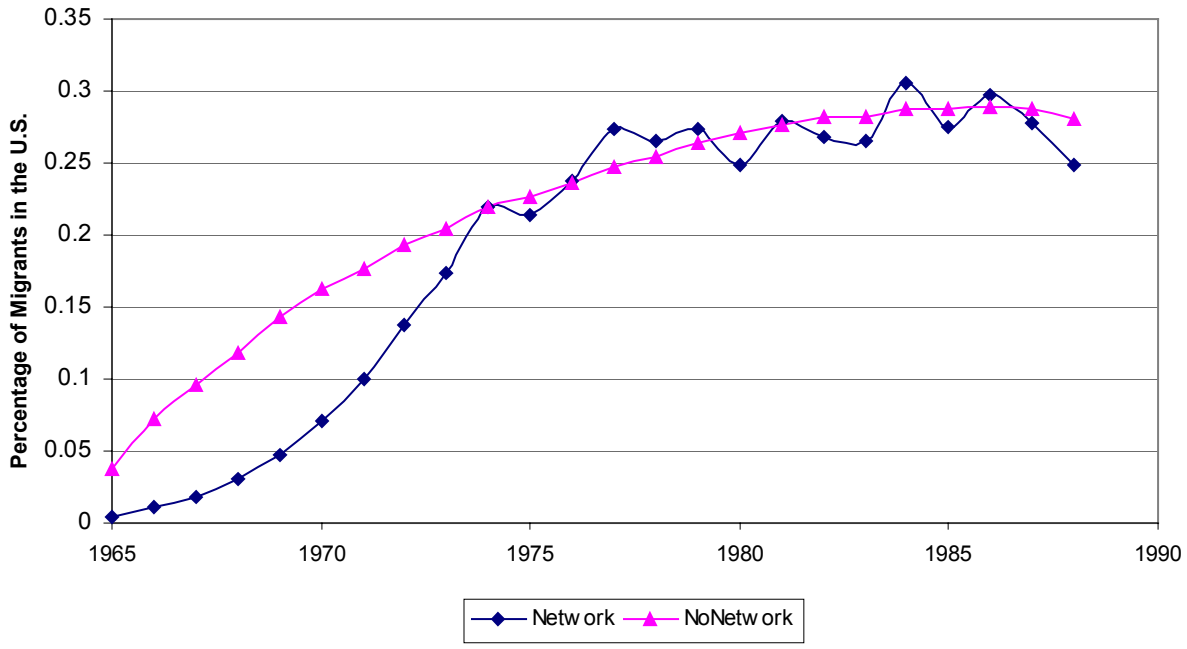


Figure 12: Cost of Crossing the Border 1 Year of U.S. Wages since 1965

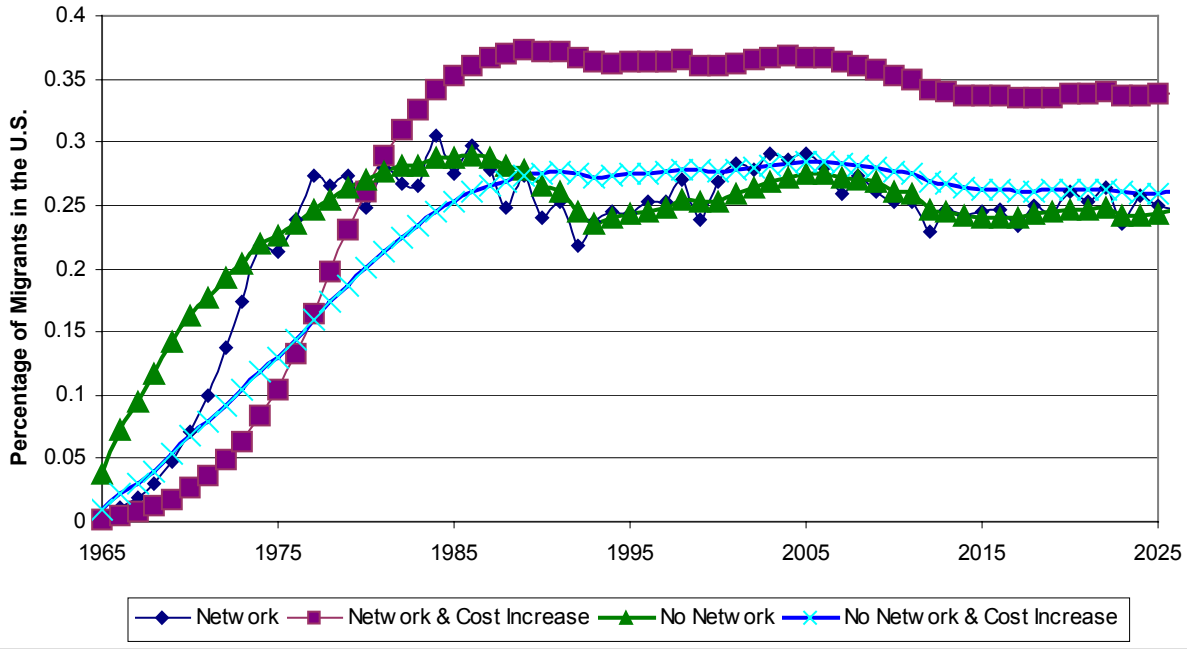


Figure 13: Cost of Crossing the Border 1 Year of U.S. wages since 1965

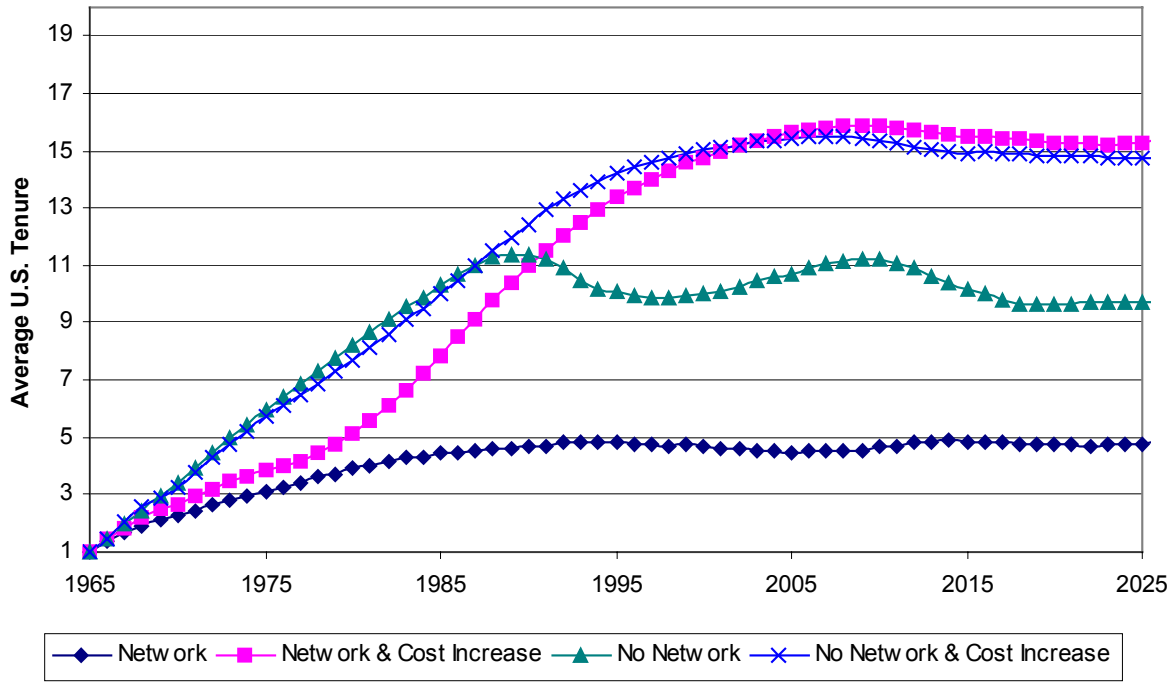


Figure 14: Cost of Crossing the Border 1 Year of U.S. Wages since 1988

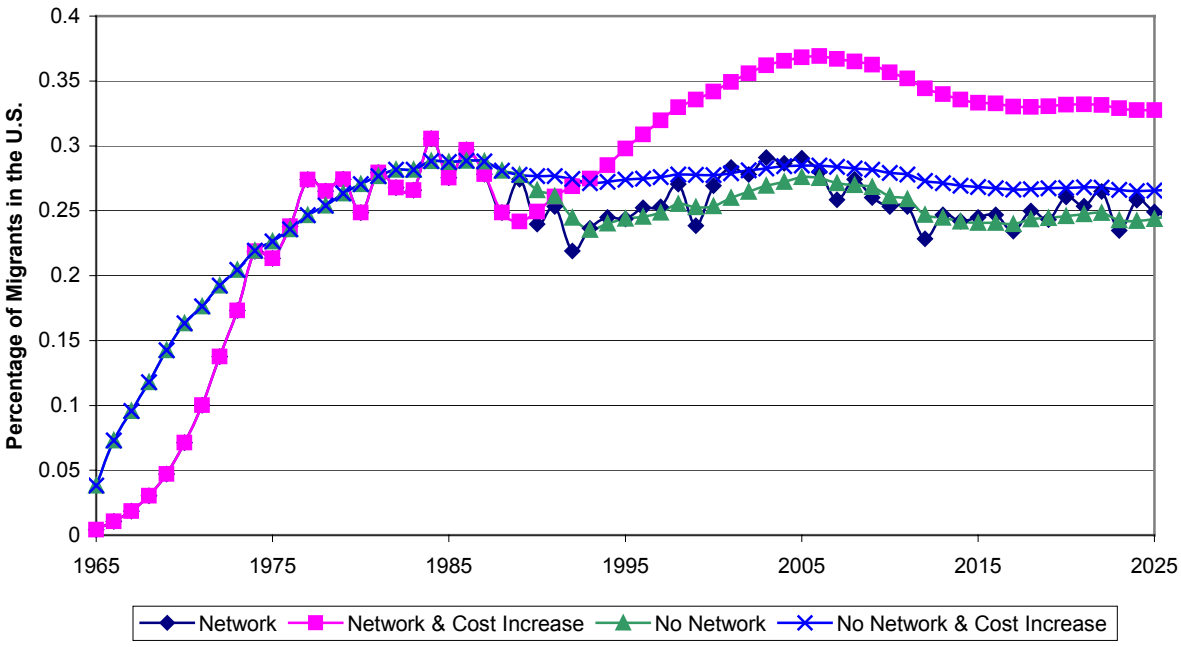


Figure 19: Cost of Crossing the Border 2.5 Years of U.S. Wages since 1988

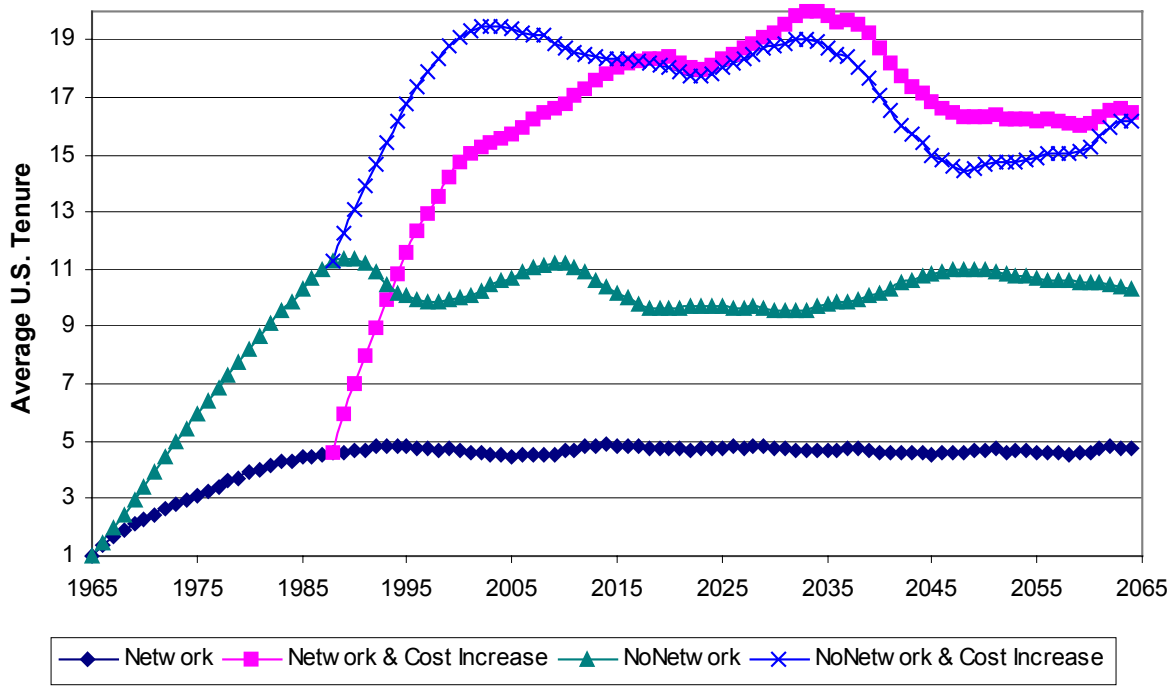


Figure 20: 10% Reduction in U.S. Wages since 1965