The Coupled Magnetosphere Ionosphere Thermosphere (CMIT) model is used to investigate the relative contributions of each electric field to the global changes of ionospheric F region electron densities during the Dec. 2006 storm. The CMIT model is capable of self-consistently simulating ionospheric electric fields that are of magnetospheric origin, and produced by the thermospheric neutral wind dynamo and penetration electric field. It is found that penetration electric fields were the primary driver of the electron density changes during the early phase of the geomagnetic storm. The neutral wind dynamo, however, contributed significantly to the global electric field and density changes during the main phase of the storm when Joule heating and ion drag enhanced significantly the global neutral wind circulation. Neutral wind dynamo became the dominant process during the recovery phase of the storm when the neutral wind fly-wheel effect still generated large dynamo field but the electric field of magnetospheric origin and penetration electric fields were very weak.